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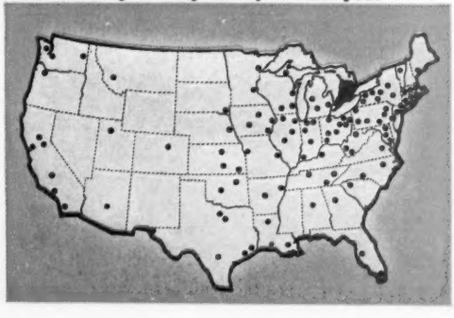

Nothing can substitute for the experience, skill and judgment of the man in the cockpit. Once he guns his motors for flight, responsibility for bringing the ship safely to its appointed destination falls squarely upon his shoulders. Only to the extent that equipment and instruments can aid the pilot by supplementing observation, reinforcing judgment and simplifying his duties, can they share this responsibility.

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THE FIRST TAYLOR "CUBS" WERE GOODRICH EQUIPPED

BORN IN 1931 AND STILL GOING STRONG

The second Taylor Cub, built in 1931, and Goodrich-equipped for safety. Called "No. 13" in defiance of superstition, this plane helped 70 flyers to obtain pilot's licenses, including two who were "flying grandfathers" . . . With 3000 flying hours to its credit, the veteran "No. 13" is still faithfully serving its owner.

. . . AND TAYLOR HAS CHOSEN GOODRICH EVER SINCE!

FROM THE very first days of the Goodrich-equipped Taylor "Cubs," the popularity of this plane has grown by leaps and bounds. Starting with 5 built in 1931, popular demand pushed production of these trim, low-cost ships to 20 a week last year. 550 were sold in 1936 alone and production is still climbing!

And no wonder. Taylor Cubs offer speed, comfort, SAFETY—the safety for example of "sitting down" at 28 miles an hour. And, adding the final element of safety needed by all planes, Taylor equips with Goodrich Low Pressure Silvertowns. Thus Taylor owners have more protection, more smoothness for every landing and take-off.

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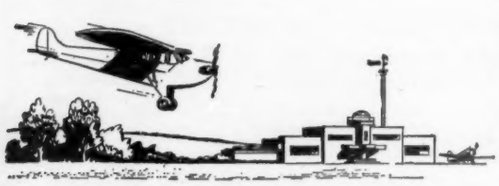
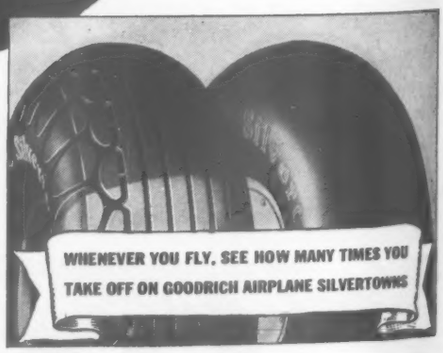
No matter what size planes you build or fly—whether light sport planes or giant transports—Goodrich has tires and over 40 other aviation products that will give you *extra* safety, efficiency and comfort. Remember, when you specify Goodrich you automatically get the benefit of experience in aviation that has caused the leading air lines, pilots and plane makers to equip with Goodrich. See your nearest Goodrich dealer or write to Dept. 631, Aeronautical Division of The B. F. Goodrich Company, Akron, Ohio, for complete information about Goodrich Airplane Silvertowns and other Goodrich Aviation Products.



TAYLOR CUB—1937 MODEL

New and improved with many more safety and comfort-giving features, the new Cub is an all-weather, all-year plane. Using only 3 gallons of gasoline per hour and little oil, these planes actually cost less to run than a popular-priced car. And because Cubs are "safety-protected" with Goodrich Airplane Silvertown Tires, landings are safe, sure and smooth.

THE 1000th CUB . . . being delivered to Blevins Aircraft Co. of Atlanta, Georgia, during the 1936 Miami Air Races. This scene recalled to mind that during 1931, its first year of manufacture, Taylor sold 5 Cubs. In 1934, 70 Cubs had been sold and in 1935 the number increased to 211. By the end of 1936, 550 cubs had rolled from Taylor production lines to their owners. Since this photograph was taken, sales of the popular Taylor Cubs have shot well past the 1100 mark.



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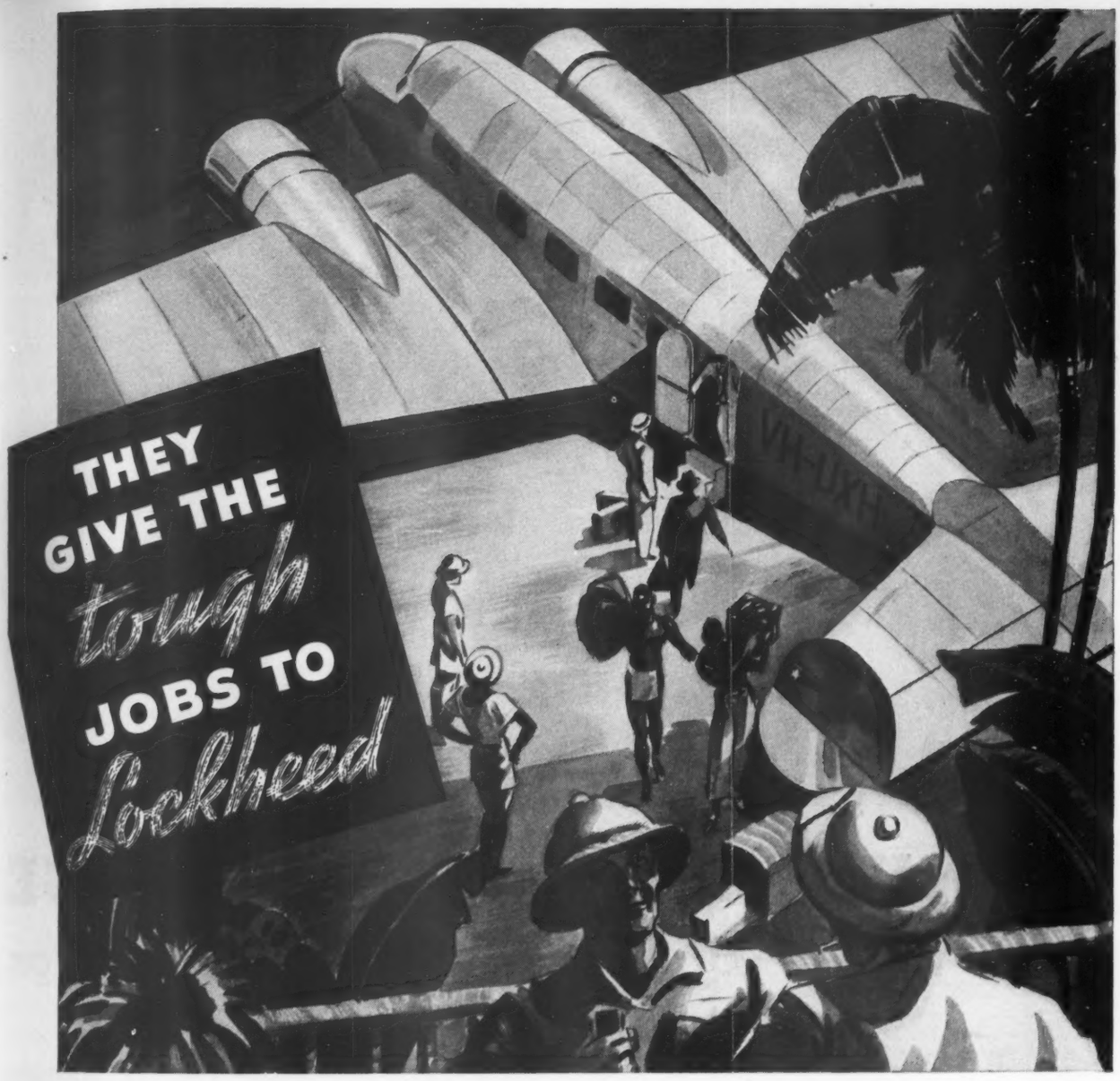

TAKE Guinea Airways, for example. This airline is the *only* means of transportation to the famous, isolated gold fields of New Guinea—a journey of 6 to 8 days by jungle trail—40 minutes by air! A complete town—its inhabitants and over 60,000,000 pounds of cargo including dredges, tractors, trucks, machinery and live stock have been flown in—and over $15,000,000 in gold flown out.

Lockheed's part in this spectacular service is characteristic of the dependable operations of these airplanes in the far flung service of airlines, private owners, corporations and government agencies in the United States and nearly a dozen foreign countries.

The success of the famous Lockheed Electra Transport, and the companion Lockheed 12 Executive Model has made Lockheed the world's largest builder of 8 to 14 place all-metal bimotor transport and executive airplanes.

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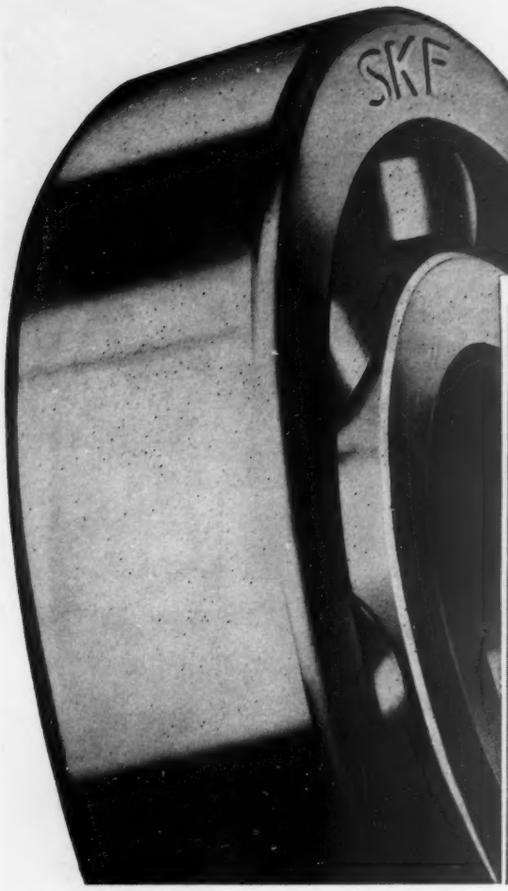

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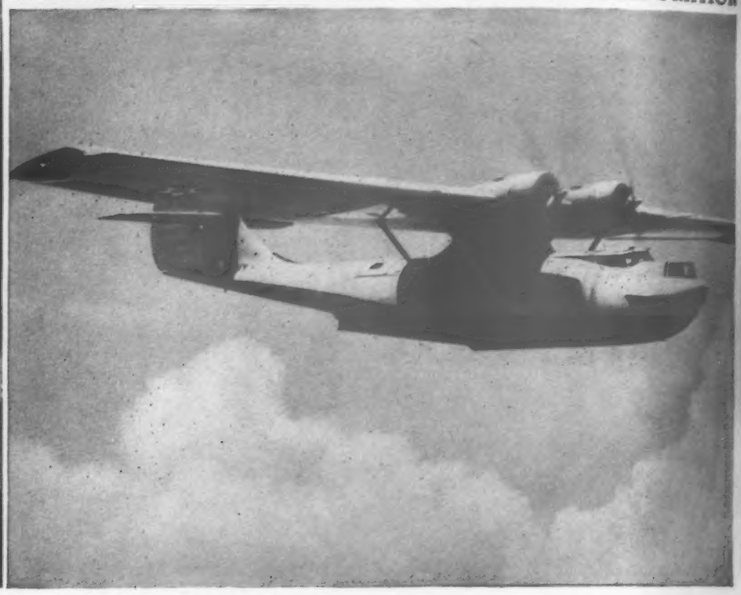

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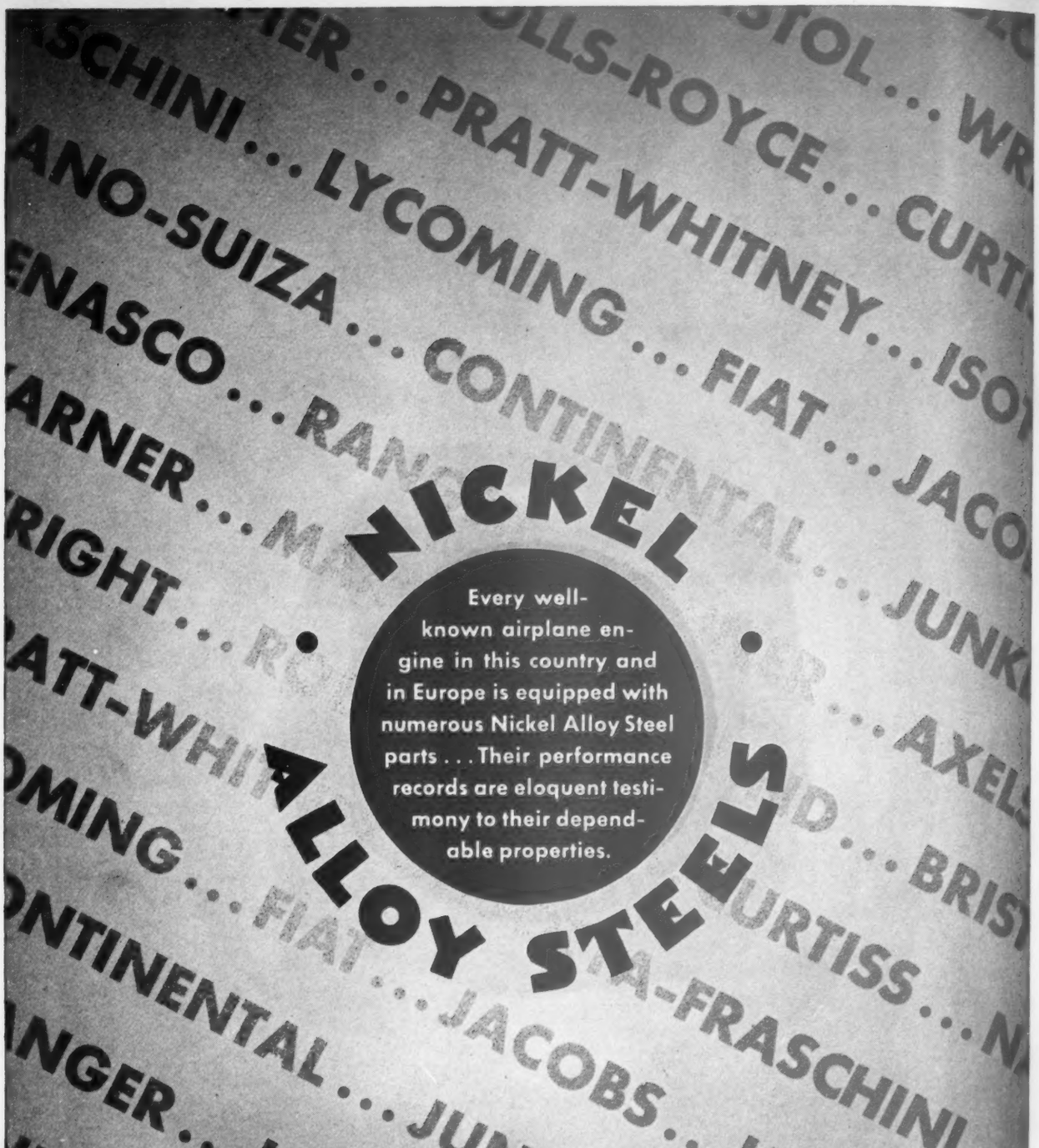
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AERONAUTICAL MAGAZINE

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Established 1916 . . . . . .
McGraw-Hill Publishing Company, Inc.

Louis F. Stoll
Vice-President

S. Paul Johnston
Editor

•

Leslie E. Neville
Managing Editor

Charles G. Cleveland
News Editor

Keith Henney
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Charles F. McReynolds
Pacific Coast

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McGraw-Hill Publishing Company, Inc.

Publication office, 99-129 North Broadway, Albany, N. Y. Editorial and executive offices, 330 West 42nd Street, New York, N. Y.

Chicago, 520 North Michigan Ave.
San Francisco, 883 Mission St.
Aldwych House, Aldwych, London, W. C. 2
Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

James H. McGraw, Jr. Chairman — Malcolm Muir President — James H. McGraw Honorary Chairman

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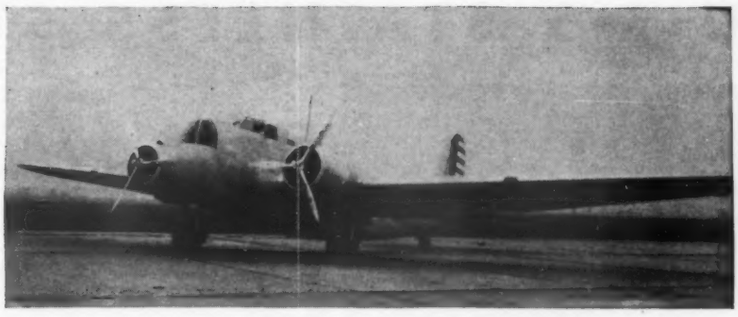
Published monthly, price 35c a copy. Subscription rates—United States, Canada, Mexico and Central and South American countries, $3.00 a year. All other countries, $6.00 a year or 24 shillings. Entered as second-class matter, September 3, 1936, at the Post Office, Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Cable address "McGrawhill, New York." Member of A.B.C. Copyright 1937 by McGraw-Hill Publishing Company, Inc., 330 West 42d Street, New York, N. Y. The following publications are combined with AVIATION: AERONAUTICAL ENGINEERING, AIRCRAFT JOURNAL, and THE AVIATION NEWS. All rights to above names are reserved by the McGraw-Hill Publishing Company.



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UNITED STATES STEEL

Flashes

From the Skyways of the World

» In the course of our recent inspection of EAL's routes we put in at Miami for a few days to look over Eastern's shop and the PAA Dinner Key Base. Practically on arrival, Andy Heermance, Miami's aviation director, took us under his wing, and from then on the going was smooth. We didn't miss much in that territory from the Goodyear blimp and Clarence Chamberlin's outfit on the causeways, to the municipal field (scene of Miami's annual All-American Races) —and the Naval Reserve Base, far inland. The latter is well worth a visit, especially to see the maintenance shops. We have seldom seen anything so "ship-shape." Lt. A. K. Morehouse, the Skipper, may well be proud of his station. We'd recommend a visit for anyone who happens to be in the neighborhood.

» Airline business has been booming at Miami this winter. Andy just sent in some figures that show that nearly 30,000 air passengers were handled in 1937's first quarter. Eastern Air's passenger business was up 20 per cent over last year, Pan American's up 52 per cent. Northbound air mail showed a 40 per cent jump over last year's figure.

» Maxine and Ben O. Howard, some ten days out of the hospital, were featured guests of the recent Los Angeles Air Show. Smiling and gay, the Howards greeted a host of friends, explained that their injuries, sustained in a crash during the 1936 Bendix Trophy race, had delayed them so far as to make it impossible to prepare a racer in time for the 1937 event.

» The widow of Capt. Charles Nungesser, Mme. Consuela Sides, has taken up flying and, under the tutelage of Tex Rankin, chief instructor for the Paul Mantz school of flying, made her first solo flight from Union Air Terminal, Burbank, Calif., early in April.

» Miss Elvy Kalep, Esthonian woman flyer, has carried aeronautical education into the cradle with her unique "Air Baby" stories which have recently been published in book form, illustrated by the authoress. Air Babies are also to be sold as dolls, and will appear in a feature comic strip. Created by an experienced flyer, the novel story personalizes aircraft of all types, and teaches fundamentals of flying to tots even before they are able to walk.

About this Issue . . .

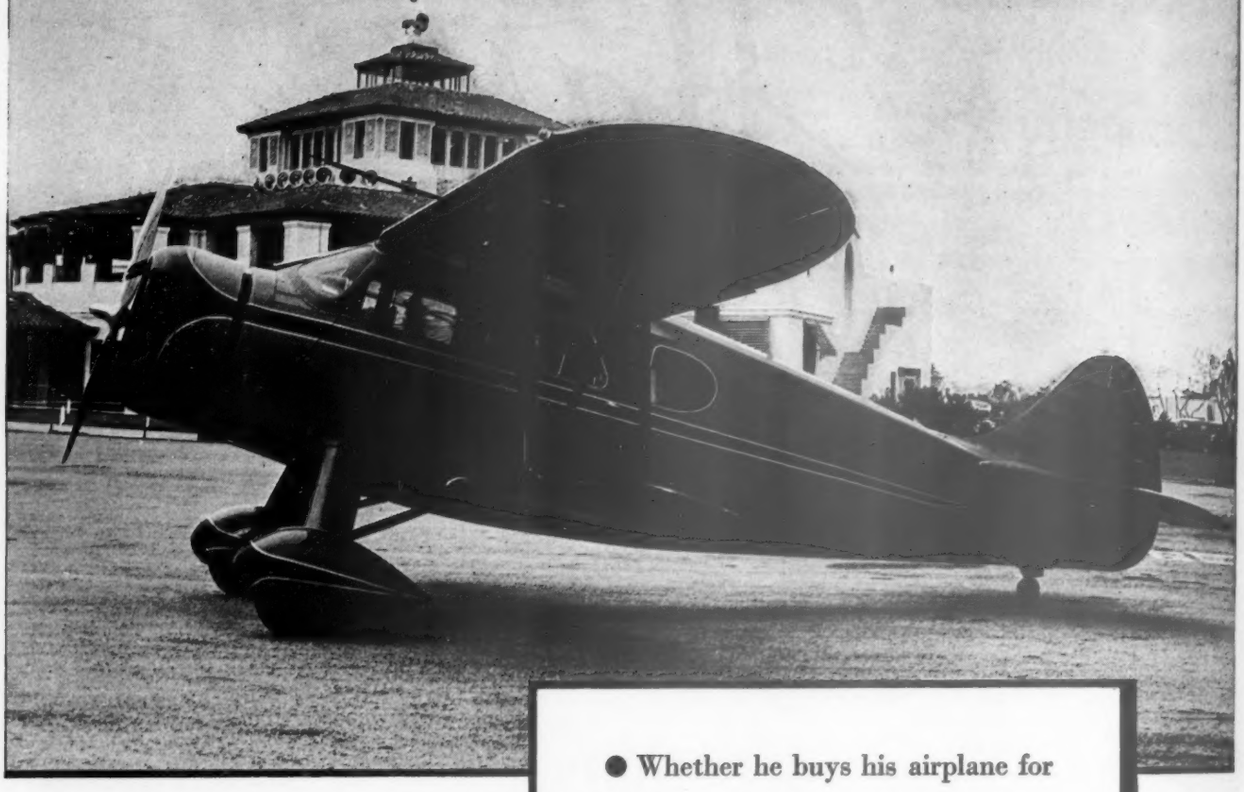
A new department beginning with this issue is the Camera's Eye View of the News on page 19. This page will supplement the regular News Section which will be found in its usual place . . . Second in our series of airline accomplishment is Eastern Air's story on page 20. Other lines are to be covered in future issues . . . Mr. Millar is a new author who gives us a first hand look at British radio control. He has written also on radio on the Empire Routes, which will appear shortly . . . The L.A. Show report comes from our West Coast editor, Charlie McReynolds . . . This time, Rockefeller and Moore wind up their series of studies on the ultimates in airplane performance.

» And although this department doesn't go in for book reviews regularly, passing mention must be made of Dan Brimm's new opus "Seaplane Handling" (Pitman) just off the press. Dan is one of our recent authors. In fact, much of the material in his book is an expansion of some of the ideas he expressed in Aviation.

» Typical of the modern business executive who places high value on his time is Henry C. Olmstead, vice-president of the Kerite Cable Company. Mr. Olmstead began to fly because he liked it, soon found that his airplane was a useful business adjunct. He now flies one of Don Luscomb's Phantoms in carrying out his widespread business activities,—and for pleasure.

» Believe it or not, failure of a fishing pole put an end to a flight that set a light-plane endurance record for women at nineteen hours 47 minutes. Miss Evelyn Hudson kept her C-3 Aeronca in the air for that length of time by the "simple" expedient of re-

WACO . . . *Preferred for Performance*



● Whether he buys his airplane for business or sport, the owner of a Waco enjoys the exceptional performance, superior stamina and economy of operation that have made Waco the most popular plane in the United States. Check the improvements in this year's line . . . wider landing gear and hydraulic brakes, giving ground control as outstanding as Waco's control in flight . . . cantilever tail group . . . a more roomy cabin . . . and many minor refinements that combine to keep Waco the preferred plane of pilot and passenger-owner alike.

Waco Leads in Aircraft Registration

WACO AIRPLANES

THE WACO AIRCRAFT COMPANY
TROY, OHIO

fueling it in flight by snagging a succession of one gallon tins of gasoline from a speeding automobile by the fishing pole route. We don't know quite what it proved, but we don't doubt that Miss Hudson and Joe Plosser, who helped on the ground, had a lot of fun at it.

» THESE DAYS PEOPLE DO GET ABOUT. W. J. Austin (president of Cleveland's Austin Company, builders of aircraft factories) took off in Florida recently, looked in briefly at his Cleveland office, hopped for California for a conference with his West Coast people, got in a round of golf in Honolulu, and dropped in at Wake Island for a little fishing — all in a week's time.

» ADD: PUBLICITY STUNTS that no "public relationist" would ever dare suggest. — Recently Miss Peggy Keys arrived in Los Angeles via American Airlines sleeper plane only to find on arising that someone at a previous stop had accidentally carried away the suitcase in which she had neatly stowed her wearing apparel. No Lady Godiva, Miss Keys merely notified the hostess, who wirelessed for a reasonably complete set of clothes.

» HERE'S ONE for any of our readers who are ambitious to write. An aeronautical book and short story contest has been announced, sponsored by the Women's International Association of Aeronautics and the National League of American Pen Women, both of Los Angeles. Prizes are offered for (a) a book of 60,000 to 75,000 words featuring aviators and aircraft; (b) a short story, 2,000 to 3,500 words, on the same subject; and (c) a child's story (six to fourteen years of age) on an aviation theme, 1,500 to 2,000 words. Contest opens May 1, closes Nov. 1, 1937. For rules and other details ask Mrs. Ellen Beamish, 217 South Lorraine Blv., Los Angeles.

NO MIDGET . . .

The hostess is built to full scale TWA specifications, but she is dwarfed by her passenger—Robert Wadlow, 19 years old, 450 pounds, 8 feet 7 inches in his stocking feet. He flew east to join Ringling, Barnum Bailey's as "The Tallest Man in the World."

» AS A WIND-UP to our 5,000-mile cruise over Eastern Air Lines collecting ideas for the story that appears on page 20, Eddie Rickenbacker invited us to attend the Third Annual Dinner of EAL personnel at New York's Park Central Hotel, March 31. Feature of the evening were five "skits" burlesquing air line operations by EAL employees. On the more serious side was the reunion of pilots, passengers and rescuers from Dick Merrill's forced landing at Port Jervis in December last. Also, Captain Rickenbacker awarded a gold plaque to Mr. Jess Briegel, New York attorney, No. 1 air traveller on EAL's Washington Merry-Go-Round. Mr. Briegel averaged three round trips a week all year for a total of some 44,000 miles.

»A word of warning to our readers: If you should receive a telephone call or a visit from anyone who claims to be a photographer engaged by AVIATION or McGraw-Hill Publishing Company, to take your personal photograph, do not be misled as AVIATION or McGraw-Hill Publishing Company does not use such methods to secure photographs of individuals.

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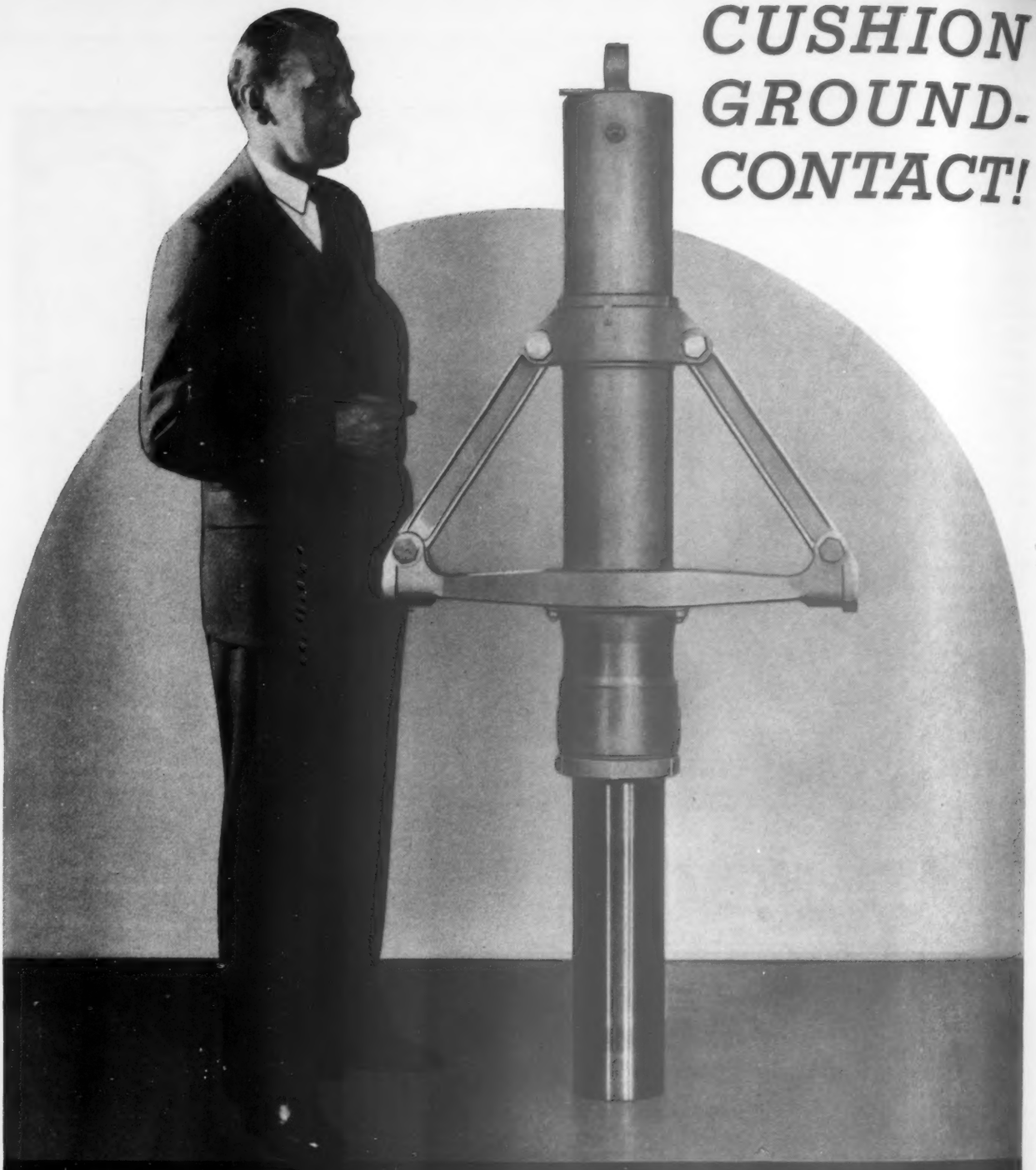

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Side Slips

By
ROBERT
OSBORN

» RECENT NEWSPAPER PHOTOGRAPHS show that some air lines, and a few cities which are purchasing municipal planes, are still making a practice of having the planes christened by fair damosels wielding the traditional bottle of champagne.

We've often wondered if these ceremonies weren't really fostered by

the propeller or engine companies, for, after the fair lady has missed the propeller hub by a couple of feet in swinging the bottle, the airplane owner generally had to invest in a new propeller blade or an engine cylinder.

» THIS REMINDS US of the time a friend of ours won a bet by flying a Farman sport plane of about 1919 vintage. This plane had two seats designed for 96 lb., 5 ft. 1 in. people, and as this pilot was 6 ft. 3 in. and weighed over 200 lb., the bet looked like a sure thing.

He fooled everybody by sitting in the rear seat and straddling the front seat with arms and legs to get at the controls.

» JUST TO SHOW YOU how confused all of the newspaper men have become in having to write up the numerous New Deal agencies, — by what Al Smith referred to as "alphabet soup", — we saw a newspaper article recently which mentioned William R. Enyart as "secretary of the N.A.A.A."

» In addition to its marvelous record for safe and efficient operation, Pan American Airways seems to be covering the romantic side of aviation very well too. After air pioneering the southern routes of the Spanish conquistadores and British buccaneers, they seem to be very thoroughly exploring and settling "colonies" in the Pacific Islands haunted by the shades of Magellan, Captain Cook and Captain Bligh. Hawaii, Midway, Wake, Guam, New Zealand, Samoa and Kingman Reef — what names to conjure with!

If Pan American ever should need additional romantic atmosphere to attract passengers at some time in the future we'd suggest a "Mutiny On The Clipper", with the Captain set adrift in the inflated rubber life raft, and with the rest of the crew and passengers flying off to live secretly on Manihiki, Easter or Marquesas Islands. Suggestion to the mutineers, after reading "Pitcairn Island": Better take along an experienced divorce judge from Reno, Nevada, and more ladies than gents.

» ROBERT WADLOW, "tallest man in the world," was recently flown from Chicago to Newark by TWA. A specially reinforced chair had to be built for him and space provided for him to stretch his legs.

If Mr. Wadlow expects to do much traveling by air in the future the airlines might look into the possibility

of borrowing a Martin Bomber from the Army Air Corps, could carry him suspended from the 1,100 pound bomb shackles.

» AT A BIG DINNER IN HIS HONOR in Washington, the one-millionth passenger on American Airlines was recently presented with a trophy, a round trip to Europe and a gold medal.

Except for a couple of sample packages of chewing gum, we've never been lucky enough to get anything free, so far as we can remember, although once we were close enough to be listed as an "also ran". A short time before the closing of Chicago's Century of Progress of a few years ago, we decided to drop in for a visit. As we bought our ticket we noticed that only one turnstile at the gate was open, even though there was a long line of people waiting to get in. By knocking down a few children and pushing a couple of old ladies aside we managed to advance in the line a bit, and get in earlier. Inside the gate we were surprised to see a large crowd held back by the police and a battery of news-reel photographers, reporters, and Fair officials. All of them pounced on the man who was about five places back of us and informed him that his was the paid admission which broke the record for all previous world fairs. Whereupon they presented him with a gold watch and sundry other gifts before taking a tour of the grounds.

"Per Ardua ad Astra"

A MICROPHONE accidentally dropped in a cockpit, a jammed control column and 11 persons are plunged into the waters of San Francisco Bay to drown within sight of their destination.

Ice, accumulating on aileron leading edges in quantities never before experienced, throws a loaded transport out of control, wrecks it on a Pennsylvania hillside. Thirteen people die. A $90,000 machine is reduced to junk.

Every accident that takes a toll of human lives, be it on the ground, at sea, or in the air, is to be deplored. We in the aviation industry can never rest for a moment until air transport is the safest of all modes of conveyance. Over and over again we have said that safety lies only in 100 per cent performance by every member of this industry, from the lowest blueprint boy in the factory to the highest executives in operating companies. In few other human activities is direct responsibility for safe performance so widely distributed. In few other fields of activity are the effects of individual carelessness or mistake so widespread or so disastrous.

The only possible thing that can be salvaged out of the shocking accidents that have occurred recently is the knowledge of how to prevent their recurrence. In these two cases the facts are plain, the method of attack for correction is indicated. A week after the San Francisco accident, the circumstances surrounding it were duplicated, fortunately without fatal results, and a clue was given that solved the mystery and yielded the solution for prevention. At Pittsburgh, by sheer coincidence, competent eye witnesses were at hand, and weather conditions were such that evidence was preserved that pointed unerringly to the cause. In the first case a simple gadget eliminated all possibility of recurrence, and in the second, the designers were at work almost before the dust had settled, to render dangerous aileron icing forever impossible.

Thus progress. Thus we learn.—But the price we pay is high.

Old Army Game

WE WERE SITTING IN THE AIRPORT RESTAURANT at X—— having a quick cup of coffee with the pilot who had just brought us in from the south. "Damn glad to get down," he said. "How come?" we asked. We knew that we had been going it blind for over an hour, but there had been plenty of ceiling at

the airport, and no alarming symptoms anywhere visible. But it seemed that when we were in the thick of it, X——— had radioed that two Army bombers had just taken off, southbound, along the airway, and had neglected to file a flight plan. Somewhere in the "soup" we had missed them,—fortunately. And that was that.

Three days later, flying westbound over another route, a pilot who was ferrying to his station told us another story. Less than a week before he had been flying serenely along his run one night when suddenly the air all about him was filled with airplanes. There was nothing to do but hold his course, and fortunately nothing happened, but he had flown right through a whole formation of bombers out on a practice cruise. Five minutes later one of his ground stations radioed for him to be on the lookout for a flight of 24 Army machines thought to be in his vicinity. His report on the subject may be imagined.

Tales of this sort have been cropping up with alarming frequency of late, and, with the great increase both in commercial and in military flying that is in immediate prospect, it is only a question of time until the word "fortunately" twice used above will turn up with a negative prefix. So far it has been good luck rather than good management that has prevented a serious tangle in the air. The Army people may feel that they must conduct their war games with a certain degree of secrecy, but short of an actual national emergency, no military maneuver is worth risking the necks of a plane-load of citizens going about their business on a commercial airline. The Army should either restrict its practice flying to areas of the country uncrossed by regular schedules, or else should be required to file full and complete flight plans with the airlines over which the planes expect to fly in plenty of time so that all pilots in the air will receive ample warning and lay their plans accordingly.

Preferred Promotion

COURAGE, AMBITION, AND CLEVERNESS are to be desired in aviation personnel, but everyone will agree that, as in any other industry, the essentials are training, loyalty, and experience.

Our aeronautic schools are putting up an outstanding performance in feeding well trained men into the industry, and obviously such training must be encouraged. But loyalty is gained only through fair treatment of employees, and the benefits of experience are made available only after such loyalty has been engendered as will prompt the employee to give long service with one firm.

Intelligent fair treatment should lead a firm to give preferred attention to the employee who possesses superior training. Where graduates of accredited aeronautic schools are employed along with men not so trained, it is to be expected that benefits will accrue if the trained men are given every opportunity to learn the background of the firm employing them, to find in what department they work best, and to progress in position so that they and their employer may both reap the full rewards of their special training. For in the final analysis it is men and not money that solves the problems of depressions and other emergencies which all industries must meet.

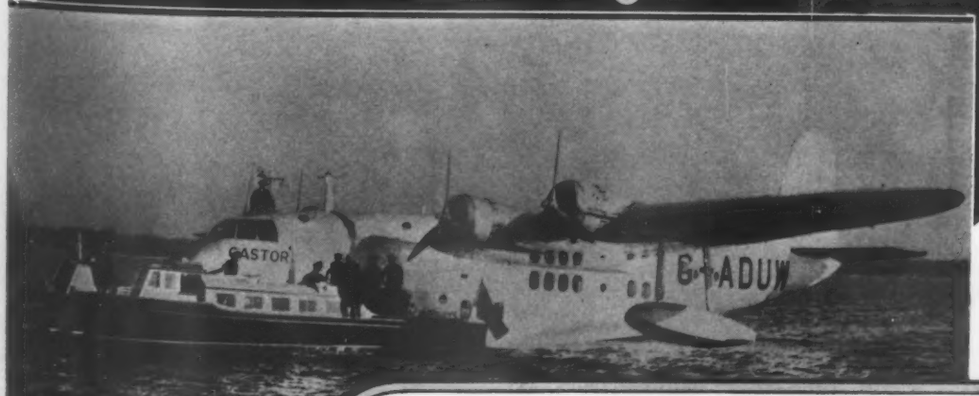
Training, loyalty, and experience have built the aviation industry to its present position and will carry it to its rightful development. To capitalize fully on these three qualities in its employees the several units of the aviation industry will do well to consider seriously organizing a preferred promotion system for men with special training.

Back to the Seat of the Pants?

FOR YEARS we have been in the front rank of the cheering section when any new gadget has appeared that promises to make the flying of aircraft safer, less dependent upon what the pilot can see outside the airplane. We have hailed the advent of accurate navigation instruments, of better radio devices, of automatic pilots and what not. Nor do we propose to swap for a seat on the mourners' bench at this stage of the game. But we do want to pass along a suggestion that has come to us from a number of pilots recently that seems to merit some thought.

Flying, like good golfing, good figure skating, or good tight-rope walking, calls for the development of a highly specialized set of reflexes that are slowly acquired, lost rapidly. Proper "air sense" may be maintained only by constant practice. In flying small ships with the minimum of instruments the pilot develops that sixth sense that tells him instantly of incorrect speed or attitude. As ships become larger, that feeling of intimacy with the machine is more difficult to retain, and, instead of cultivating it to the greatest possible extent, the natural tendency is to rely more and more on the instruments. All of which is fitting and proper, but the danger lies in letting it go too far, in becoming so dependent upon instruments and other flight aids that all "feel" of the ship is entirely lost. We are fully aware how unreliable a pilot's flight sense may be at best, but now and again occasions do arise when instruments go out, and the pilot may have nothing left except his "feel" of his ship. If he has permitted that sense to become dulled through disuse, he may find himself in a bad spot.

No suggestion this for chucking our instruments overboard and going back entirely to the unreliable indications that are transmitted via the seat of the pants, but there is some sense in the suggestion that all pilots should practice regularly some "under the hood" flying without instruments. Necessary, of course, are carefully selected conditions, and constant supervision of a check pilot. Some pilots admit doing this voluntarily in order not to lose that "feel" that they believe necessary for safe handling of their ships. Not a bad idea, we think, and one that should be studied carefully by all operators.



1, Col. Lindbergh refuels his Miles Mohawk at Bombay (Wide World). 2, No. 1 of the DC-3s for TWA. 3, Frank Hawks figures his speed (Acme). 4, Tops for Women: Louise Thaden wins the Harmon Trophy (Harris & Ewing). 5, Taylor resumes Cub production after Bradford fire. 6, "All-Air" Service for the British Empire. "Castor" leaves Southampton for Alexandria (Globe). For further news see page 52.

Camera's Eye on the News

With The Great Silver Fleet

Eastern Air Lines looks back with pride over the ten-years of its existence.

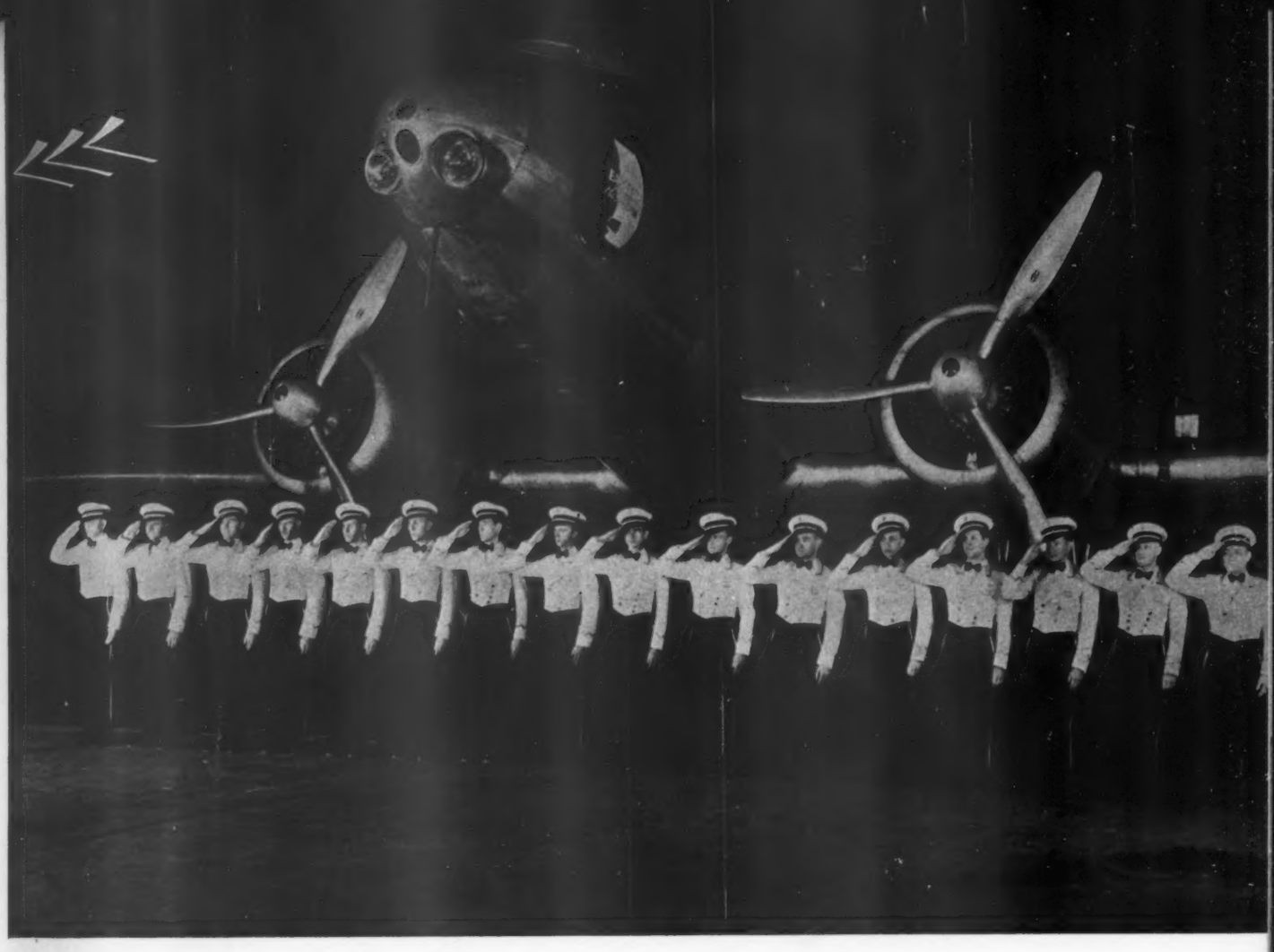
EASTERN Air Lines

NO RECORDS EXIST of the thoughts that raced through the mind of a certain lean, hard-bitten fighting pilot of 1918 when, roaring and twisting through tracer-creased skies, he awaited the instant the pressing of a button would release a stream of lead into a black-crossed ship ahead. Far easier to speculate upon what that pilot did *not* think about. If Captain Eddie Rickenbacker of the days of the A.E.F. ever allowed his thoughts and ambitions to range beyond the next day's patrol, it is extremely doubtful if his wildest speculations foresaw the day when he would sit pushing buttons to release great silver bullets, loaded with passengers and freight, on daily schedules from the Hudson to the Gulf, from the Great Lakes to the Florida Keys.

Today, Captain Rickenbacker runs Eastern Air Lines with that same combination of geniality and the ability to make accurate decisions quickly and to make them stick that made him popular in France. To the hundreds of employees up and down the line he is "The Captain", and the title thus used is not just a hangover from army days.

In the earlier stages of its history, Eastern Air had suffered growing pains, had not always functioned as a homogeneous unit, had had frequent internal political troubles. Such situations, always dangerous in any organization, may be fatal in an airline. Recognizing the symptoms, Rickenbacker's first concern was to get everyone working in the same direction all of the time. In the two years of his administration, he has succeeded in creating an *esprit de corps* in the system that has never been known before.

Perhaps the best way to see just how he has done it is to watch him at

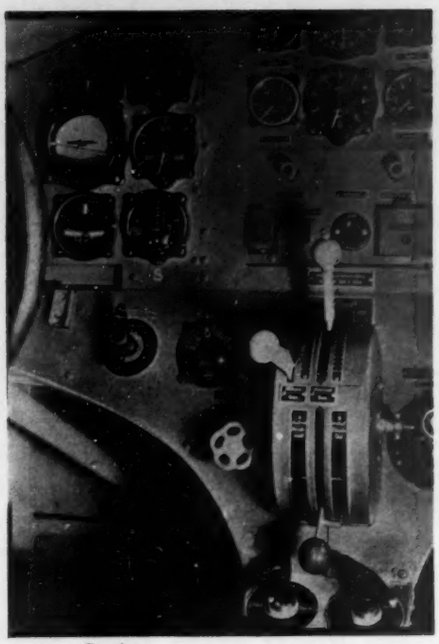


work in one of E.A.L.'s operations meetings held monthly in New York. Here all department heads, — from Miami, from Atlanta, from New Orleans, from Chicago, — sit down to discuss their troubles. Here every matter relating to the smallest detail of procedure or policy is thrown on the table for discussion. Inter-departmental difficulties are ironed out, plans for the future are made, budgets are balanced. Everyone may have his say, openly, without fear or favor, and careful records are kept (available to all) so that there can be no misunderstanding, nor temptations to "pass the buck". All departments are required to make written monthly reports which become a part of the record.

At the head of the long table sits the Captain, in front of him are piled the departmental reports; alongside, the Recording Angel in the person of an efficient secretary. Down one side of the table: Paul Brattain, assistant general manager and general traffic manager; Sidney Shannon, operations manager; George Gardner, assistant operations manager; Marie Sullivan of the Woman's Department; Hubert Huntington, chief air navigation engineer; Henry Blevins, instructor on Link Trainer; Flight Captains Larry Pabst and J. H. Brown (all flight captains in New York on meeting days must attend); Beverly Griffith director, public relations and Ping Ferry, publicity; Down the other side: Don McRae, communications superintendent; next Charles Froesch, chief engineer; Leslie Frazeur, superintendent of maintenance; John Brock, purchasing agent; Walter Avery, superintendent of passenger service; J. J. George, chief meteorologist; Neil McKenney, chief dispatcher; Edmond Denis, Weddell-Williams Division; and J. J. Mehl, treasurer.

Department after department reports, — up and down the table goes the discussion. What is the last word on delivery dates for the eight new Douglas DC-3's? How is the Link Trainer set-up at Newark getting along? Shall the Stinson blind flight training plane be based at Miami? What about air conditioning the planes for the coming summer? What about some new loading ramps? Shall there be a seat 13 in the ship? (Actually, people, — women chiefly — refuse to ride in seat 13). Where should the oil reclaimer be put? What color curtains for the new ships? What about the telephone connections in Chicago? Who will buy the last Condor? How can the ships be kept cleaner? Should baggage handlers take tips? How about some new baggage tags? How are the new radio sets coming along? — and so on, far into the night, if necessary, until every

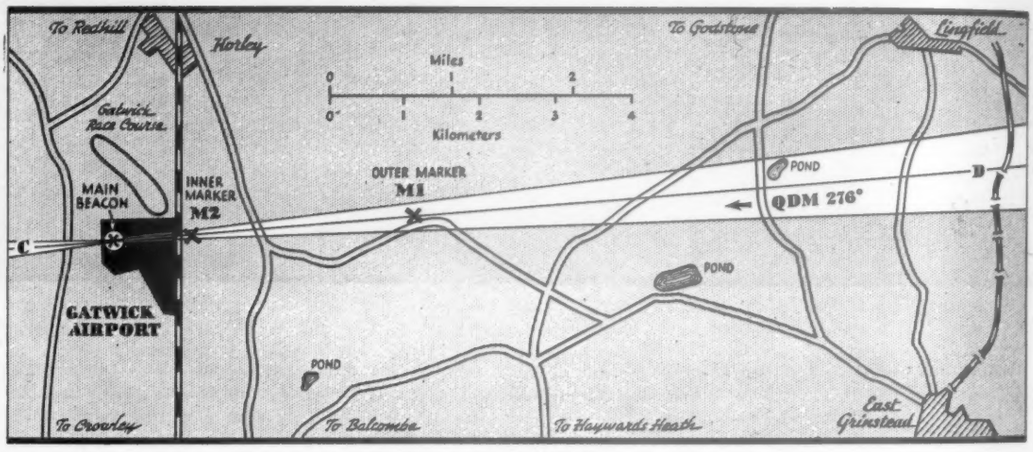
(*Turn to page* 70)



Courtesy
Electrical Communications

Above, Instrument board for Lorenz landings.

Right, Main and marker beacon layout at Gatwick Airport (England)



"Q.B.I."

How the British handle their Traffic Control Problem when the fogs roll in

By John Millar,
A.R.Ae.S.I.

TEN YEARS AGO Croydon Control handled all airline traffic in England. Today the country is divided into Communications Areas, each with its central control located at a chief airport in the area. In addition, certain other important airports within controlled areas are surrounded by controlled zones.

The allocation of frequencies for all purposes (an international matter for obvious reasons) is largely political. The present distribution of frequencies from 10 to 60,000 Kcs. (30,000 to 5 meters) among the various services was confirmed at the International Telecommunication Convention at Madrid in 1932, and agreed by the Governments of the European Region.

Naturally everyone wants an unlimited number of high power broadcasting stations on the low frequencies (long waves). The States who got in first in the early days of radio took the best frequencies and naturally object to giving them up to other countries who were not so quick at realizing the immense political value of having state controlled stations to broadcast political views. The net result was a compromise, with aviation coming off poorly in proportion to its importance and in comparison with its standing in the United States.

The bands allotted for aviation communications restricts to an extent the type of transmission, consequently telegraphy rather than telephony is generally used.

As mentioned above, Central Control is the chief authority in each area. The three more important areas with their central controls are:

1. *London — Continent Airway Area* which includes London and broadly South East England as far as Clacton in the North East, out to the North Hinder Light Vessel in the North Sea; and from London, South to Pevensey Bay on the South Coast. Central (Area) Control is at Croydon Airport and Local Control. Croydon is the chief airport in the area.

2. *The Heston Communication Area,* covers the North-West boundary of the London-Continental Airway Area as far as Holbeach; Leicester; and Alcester in the North; Andover; Guildford to the West; and a corridor from Guildford to Shoreham on the South Coast. Chief Airport and Area Control is at Heston. Gatwick Airport in the Heston Area controls its own local zone surrounding the airport.

3. *The Portsmouth Communication Area* extends south from Shore-

ham across the English Channel to Cap de la Heve, France; follows the French coast to cap de la Hague to the West; then North to a position in the Channel 50° N: 2° W. Then 1° West to 50° N: 3° W. North to Bridgewater, Somerset; rejoining the southern boundary of the Heston Area at Andover.

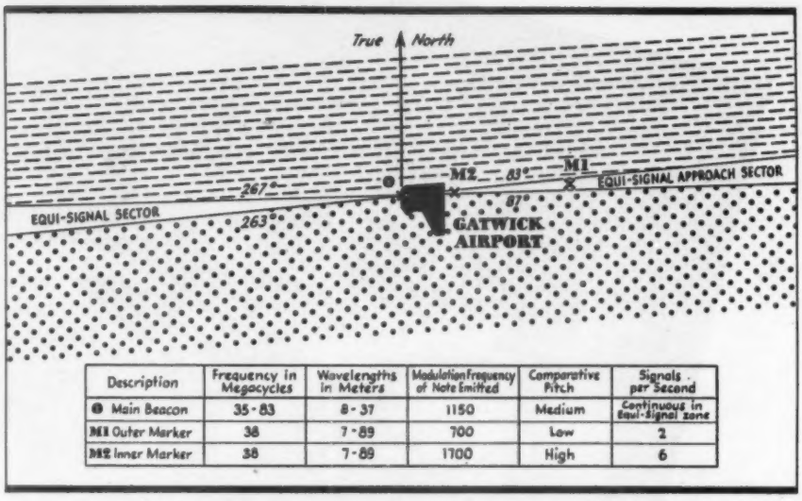
Central control of the area is at Portsmouth Airport.

In addition to the radio controlled airports mentioned above, all other airports having radio stations are considered as having also their own local controlled areas 5 miles in radius from the airport and 2,000 feet high.

Operation of Control. In good weather and visibility the course and height of an airplane are left to the discretion of the pilot. In bad weather, defined as visibility less than 1,000 yards horizontally and vertically, no machine may enter the local controlled zone without first obtaining permission from the Central Area Control. Thus when the weather is "QBI"—the code signal for the conditions defined above — and when QBI control is in force, only machines with 2-way radio may fly in controlled areas.

An example of the principle of area and local control can be given by assuming the departure of one of British Airways' airplanes from Gatwick airport, the line's headquarters. The pilot would receive his departure instructions from the Local Control at Gatwick, but on leaving would contact the Area Control at Heston, reporting his departure, height and destination, even though he was not flying to Heston, but probably in the opposite direction to Paris.

The use of flight plans and the scientific cruising control of scheduled flights, standard practice in the U.S. seem to be quite unknown in England.



Description	Frequency in Megacycles	Wavelengths in Meters	Modulation frequency of Note Emitted	Comparative Pitch	Signals per Second
● Main Beacon	35-83	8-37	1150	Medium	Continuous in Equi-Signal zone
M1 Outer Marker	38	7-89	700	Low	2
M2 Inner Marker	38	7-89	1700	High	6

Disposition of equi-signal approach sector and sectors in which Dots or Dashes predominate (Gatwick Airport)

Control of Approaches. A pilot requesting his position in the Croydon controlled London-Continental Airway Area will first call Croydon. He will be told to run his generator, i.e. to send out his carrier wave and will then have a bearing taken on his airplane by Croydon, by the station at Lympne and by the station at Pulham, simultaneously, and these bearings, transmitted to Croydon by radio from Pulham and Lympne, are laid out on a large scale chart (1 in 250,000) in the control tower at Croydon, and radioed back to the pilot. A position or "fix" can be provided within a minute and a half of request. Pilots of Imperial Airways are supplied with special "D.F." maps and often the radio operator will intercept the radio message from Lympne and Pulham to Croydon giving his bearing from their stations, and plot his position himself on his own map, and then check with the position given him by Croydon.

The position of each radio-equipped airplane in the controlled area is marked with an identification pin-flag, the direction of the flag indicating an inbound or outbound plane.

In the London-Continent airway area all airplanes flying below 2,000 ft. must fly on one of the defined air routes e.g. Route 1: Croydon—Purley — along railway to Merstham — Redhill (turn left) to Tonbridge — along railway to Ashford — Lympne and then out across the Channel. All aircraft flying at or below 2,000 ft. must fly on the Right side of each defined air route. These at least are the rules.

Direction Finding Service. There are nineteen radio stations in Great Britain and Northern Ireland working in the frequency band of 332 Kcs (932 meters) to 363 Kcs (826 meters) which are equipped to give bearings to aircraft and according to the request of the pilot the type of bearing given will be one of the following:

The *True* bearing of the airplane from the Station.

The *Magnetic* bearing of the airplane from the Station.

True Reciprocal bearing of the airplane from the Station.

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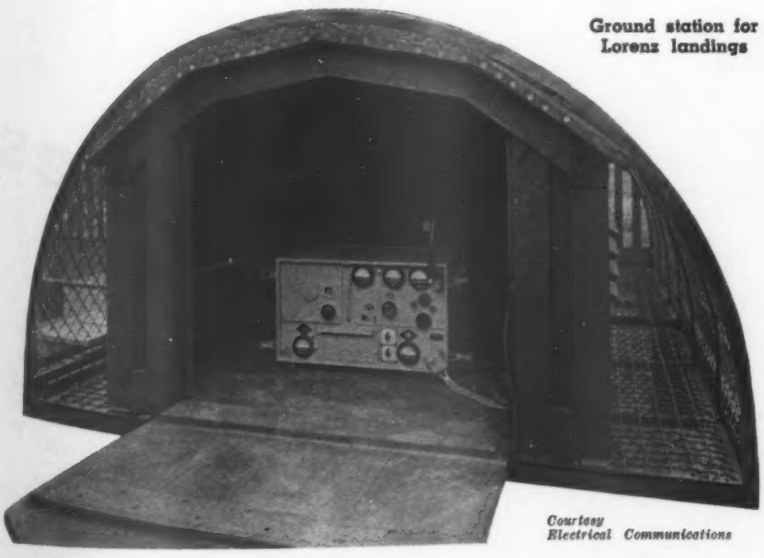
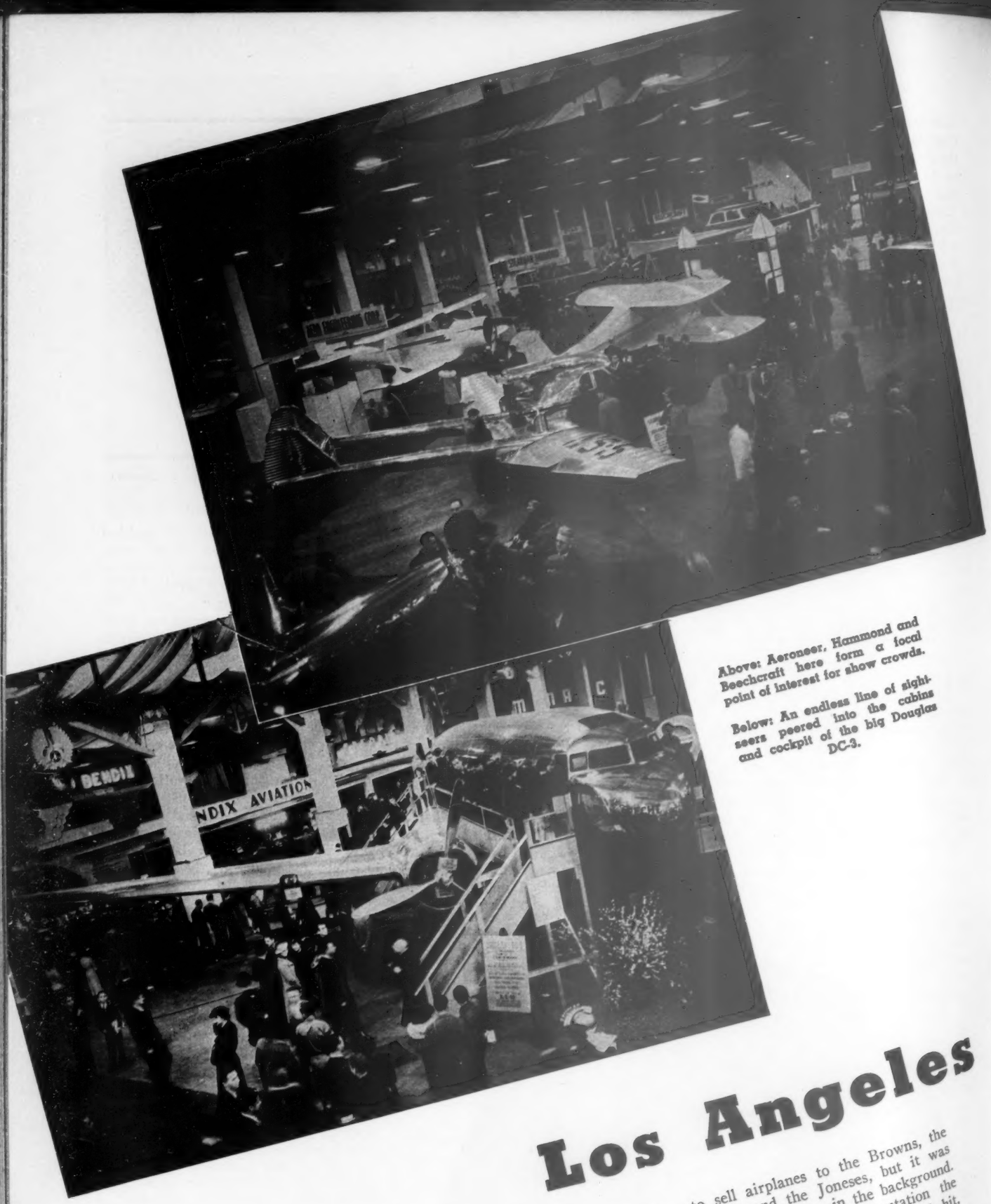


Ground station for Lorenz landings

Courtesy Electrical Communications



Above: Aeroneer, Hammond and Beechcraft here form a focal point of interest for show crowds.

Below: An endless line of sightseers peered into the cabins and cockpit of the big Douglas DC-3.

Los Angeles

PLANNING FOR THE FUTURE was the keynote of Los Angeles' recent Aircraft and Boat Show (March 13-21), for after seven lean years the industry is sunning itself pleasantly in the warmth of definitely reviving business.

The Show struck a new high in giving the public the low down on things aeronautical. Educational efforts of a graphic and dramatic nature were the rule rather than the exception.

As one man, the industry agreed that the prime problem was of teaching the man on the sidewalk something of the progress being made in aviation. Effort was made, of course, to sell airplanes to the Browns, the Smiths and the Joneses, but it was kept more or less in the background. As an educational presentation the Los Angeles Show was a real hit, and one that will be pulling in results in the form of sales of airplanes, and use of plane services, all through the year to come.

1937 National Pacific Aircraft and Boat Show an Indicator of Future Merchandising Trends.

But there is more to the general Show story than to report on any individual exhibition. If any good is to come out of the show business quite a number of problems must be faced and solved. This year there were two shows at widely separated points and fairly close together in point of time. The industry must decide whether it wants and can support two shows, whether to combine on one big show each year,—possibly varying the site by mutual agreement,—or whether more than two shows should be encouraged. Shades of '28 and '29!

The industry is also a long way from a complete understanding as to proper division of show expenses between factories, distributors, and dealers. Intelligent cooperation will solve these problems, but with reservations already coming in for a 1938 Show in Los Angeles it seems important that considerable thought and effort should immediately be given to working out an industry-wide program for shows in years to come.

Success marked the efforts of the aeronautical industry this Spring both at New York and Los Angeles. Perhaps, since Los Angeles can compare its '37 effort with that of '36, the latter city serves as the best example of present trends in aeronautical showmanship. Most significant, perhaps, was the general attitude as each show closed. In '36 the industry left the show with the attitude of "Wait and See" about 1937. This year the Show closed with everyone signing up for '38 Show space, openly discussing bigger and better '38 Show plans. In this connection it is significant that Los Angeles Shows are sponsored by a group that has always shown a commendable willingness to work harmoniously together for the common good, the California Air Industries Association, representing Douglas, Lockheed, Consolidated, Northrop, North American, Vultee, Menasco, Kinner, Ryan and many others, all of whom have shown.

Last year the Show was only approximately 80 per cent sold out. The '37 show was a one hundred per cent sell-out. It was even necessary to put the two restaurants outside of the main buildings in tents, and to mount the orchestra and radio broadcast platform on a balcony to get it out of the way of main floor exhibits. Working on the same budget as in 1936, the Show Committee this year succeeded in decorating the building much more elaborately than last.

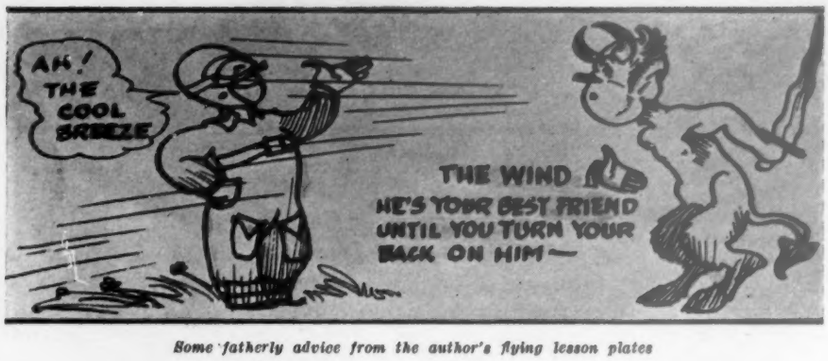
Attendance this year ran approximately 90,000 paid customers, as compared with 75,000 in 1936. This year, with about twenty per cent more exhibitors getting refunds, the percentage refund to exhibitors is 15.3 as compared with 14.5 per cent in 1936. Incidentally, the boat people exhibiting in the Show made bona fide sales during the Show period of about $160,000. As a result of space demands this year it is thought probable that the Pan Pacific Auditorium building will have to be materially expanded before the 1938 show. There is also talk of advancing the '38 show to a later date, possibly the first two weeks of April, to move a little more definitely into the Spring season.

A Douglas DC-3 dominated the building and held the attention of large crowds daily. A system of public address announcers, coupled

(*Turn to page* 76)

Lights a **Merchandising Match**

Typical of the many well executed "live" exhibits was Sperry's demonstration of automatic flying.



Some fatherly advice from the author's flying lesson plates

By Richard Spencer
Founder, The American Escadrille

Poor Man's School

The Story of the Cheese that led to a new idea in aeronautical education.

HOLD A PIECE OF CHEESE no larger than the head of a pin within 50 ft. of any member of the Spencer family if you want to see a hasty retreat. Tell any one of four hundred flying students and 7,000 American Escadrille Cadets that cheese was an important factor in the chain of events that led to the development of the method of instruction they are using and they won't believe you. But before we get to the cheese that marked the turning point in the author's career we must go back to happy 1929 when he was bringing home the bacon as a cartoonist.

Everything probably would have gone well if I had not wanted to get back into aviation, the bug that bit me when I was in the U. S. Naval Aviation during the World War. I gave up a good business and started a flying school at Ft. Worth, Tex. And I started it at exactly the wrong time. Money got scarcer and scarcer in the early thirties until it almost disappeared. "Script" money and even potatoes became the medium of exchange. And then one afternoon a student trudged up to the airport with a huge package. He asked how much flying time he could buy with it. Frank Shelton, my chief pilot couldn't overcome the inherent instinct of five generations of Texas "Hoss Traders," and the swap was made. The contents was the epoch making full scale American cheese. We were pretty hungry but that was the turning point. Long before the last vestige of cheese had disappeared we had closed up shop and headed for New York.

But if we were going to go back to the bacon by the cartoon route we were sadly mistaken. Things had happened to the illustrating business. There was neither cheese nor bacon to be had in exchange for cartoons nor was there the wherewithal to buy either of them. Some serious thinking led to the combination of cartooning and flying instruction. That plus the idea that quantity sales of time must be made on a lesson rather than an hourly basis was the foundation of the American Escadrille. If anyone had a sincere interest in aviation and 50 cents he could join and get the primary course of illustrated lesson plates showing by the cartoon method how an airplane is flown and maneuvered. Then the member could grow with his income and with the Escadrille.

The Escadrille is international in scope. At present the lesson plates are being translated into Spanish in response to insistent demands from South America. So far only one flying chapter has been formed at the Floyd Bennett Field headquarters. As soon as sufficient transport pilot material is developed at the home base, we will move down the Atlantic seaboard, organizing new bases of operation. Although 67 of the 400 students at the home base have soloed since last September and are piling up time as rapidly as possible, it may be necessary to employ some outside instructors to fill the demand for new bases by members throughout the country.

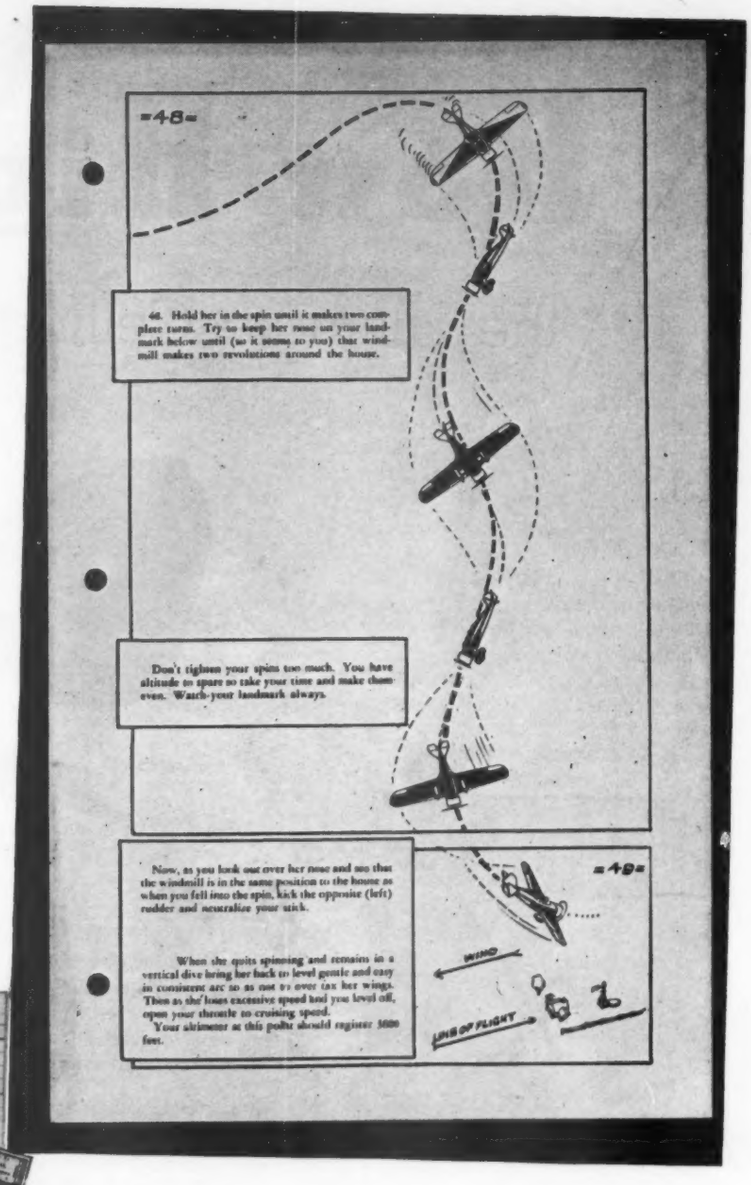
Left to right (standing): the author, Instructor Reynolds, Maintenanceman Trolling, Instructor Klasmeier: (seated): Chief Pilot Speterer, Operations Manager Turmel.

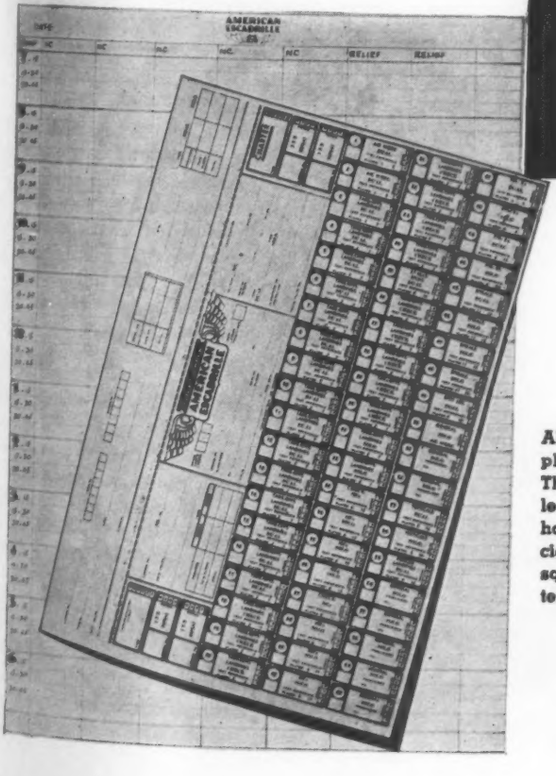
At present we operate five Taylor Cubs, Kinner fleets and a Fairchild and have orders in for more Cubs for the summer rush. Of course there is always the problem of ships lying idle on weekdays and being overworked on weekends. We encourage students to come out during the week, even if they have to come out very early in the morning before business hours. The appointment sheet illustrated herewith has been found very helpful in smoothing out the traffic flow. By leaving the last quarter of each hour unassigned and by having two relief ships on busy days, we can juggle our appointments to cover almost any emergency.

Each 15-minute lesson, whether it be air or ground work costs $2.00 and some students buy as little as one lesson a week. Most of them are able to spend $4.00 and buy two lessons or ½ hour each week. The entire course consists of the 60 lessons outlined on the accompanying chart. Reference to the cartoon lesson plates make it possible for the student to prepare himself for his lessons in advance. Solo work is carefully supervised from the ground by check pilots and observers with field glasses.

Students at the home base are a cosmopolitan collection. At present 22 languages are represented with those of latin origin in the ascendancy. Most of the students are about twenty years of age but we had one man over fifty who got his license in 65 hours. For some reason workers in the radio industry seem to be the best prospects but the students range from slaughter house employees to members of the diplomatic corps.

Most of our major maintenance is done by outside shops but frequent equipment checks are made by students and instructors. Engines are overhauled every 300 hours whether they need it or not. The American Escadrille is growing fast. We believe the reason behind its growth is that we give our students a full dollar's worth and we have brought the cost of instruction within the means of everyone who has a job.

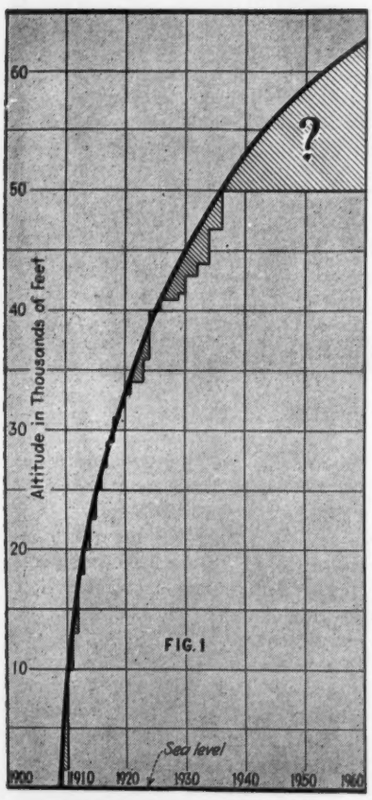

-48-
48. Hold her in the spin until it makes two complete turns. Try to keep her nose on your landmark below until (so it seems to you) that windmill makes two revolutions around the house.
Don't tighten your spins too much. You have altitude to spare so take your time and make them even. Watch your landmark always.
Now, as you look out over her nose and see that the windmill is in the same position to the house as when you fell into the spin, kick the opposite (left) rudder and neutralize your stick.
When she quits spinning and remains in a vertical dive bring her back to level gentle and easy in continuous arc so as not to over tax her wings. Then as she loses excessive speed and you level off, open your throttle to cruising speed.
Your altimeter at this point should register 5000 feet.
-49-
WIND
LINE OF FLIGHT



Above: A typical lesson plate on spinning. Left: The appointment sheet leaves the last quarter hour open for emergencies. Each numbered square represents a quarter-hour lesson.

How High?

IV. the Ultimate Ceiling of Aircraft



The Time-Altitude curve is tending to flatten, indicating that the probable height limits for conventional heavier-than-air craft are being approached.

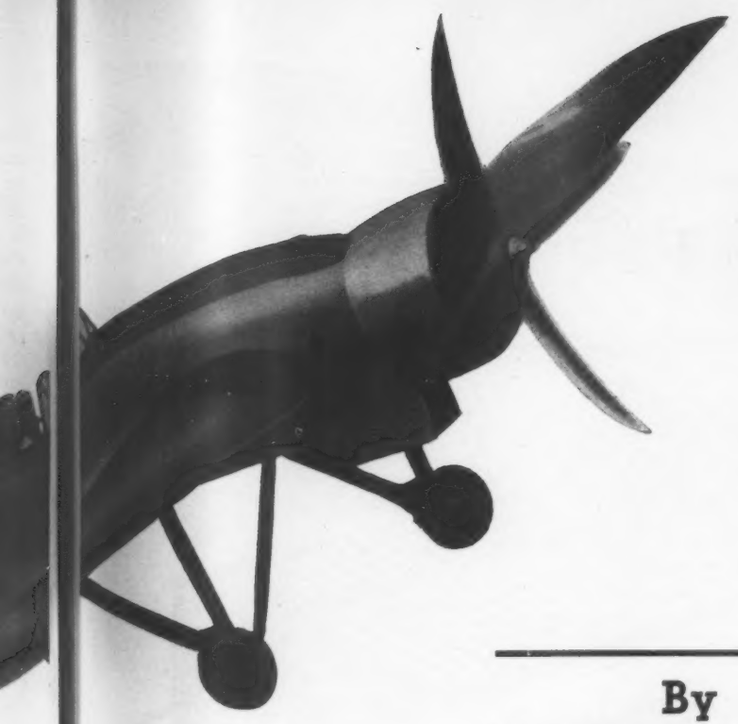
AMONG THE CONSUMING INTERESTS of the aircraft industry during the past two years has been the problem of stratosphere flight. Many speculations have been made as to the maximum altitudes which will be used for regular transport work in the future.

It is of interest, therefore, to arrive at some conclusion as to the maximum practical limits which can be reached by the conventional aircraft of today. Furthermore, one of the major records of today is the maximum altitude reached by aircraft. A prediction of the maximum altitude which aircraft will reach in the future will certainly be a convincing limit as to the maximum practical altitude to be used in air transport. It is the purpose of this article to establish this maximum.

Just recently this altitude record was broken by Squadron Leader Swain using a specially designed plane built by Bristol, and an altitude of approximately 50,000 ft. was attained. This record together with the records established since the earliest days of flying have been plotted in Fig. 1, representing altitude against time. It will be seen from this figure that the yearly increase of record altitude has suffered a steady drop and the curve representing this tendency clearly indicates an approaching maximum altitude beyond which the conventional airplane of today will not ascend.

SUCH a tendency did not exhibit itself in the similar curves made up for maximum speed and range presented in previous articles of this series. Although a greater proportion of the energy of the aircraft industry has, in the past seven or eight years, been devoted to the building of aircraft destined for more immediate practical importance, such as for commercial and military purposes, none the less all of the record advances have suffered from the same decreased support. We would expect, therefore, that the major records would keep apace with one another and if there is a divergence in their advances we should like to determine the reason.

In order to study the ultimate ceiling to be attained by aircraft we must first determine what factors are most important in determining this limit and the extent to which they affect the limit. When an airplane is flying at its absolute ceiling, all of



By

Dr. Norton B. Moore

Instructor in Aeronautics
California Institute of Technology

and

W. C. Rockefeller

Aerodynamics Engineer
Douglas Aircraft Company

its thrust horse power available is used in overcoming drag. Thus the two most important factors which must be investigated are the thrust horse power available and the drag.

In the second article of the series a figure was presented showing the variation of air density, along with numerous other factors, with relation to altitude. It will be noted from this figure that at 50,000 ft. the air density is only one-seventh of that at sea level. This means that an airplane flying at 50,000 ft. would have only one-seventh of the parasite drag and seven times the induced drag which it would experience if it were flown at the same speed at sea level.

Furthermore, a simple calculation will show that for an "ideal" airplane, that is, one in which the phenomenon of burbling or stalling, does not occur, the total drag is made up of three-fourths induced drag and only one-fourth parasite drag. In the case of an actual airplane this proportion may become as low as two-thirds induced drag and as high as one-third parasite drag. It is clear from the above that the induced drag becomes by far the more important of the two factors.

Figure 2 shows the variation of the absolute ceiling with the parameter Λ, defined in the figure. The thrust horse power included in this parameter is the net thrust horse power available at the absolute ceiling and b_e is the equivalent monoplane span in feet.

In order to show the relative importance of these various factors which determine the absolute ceiling, Fig. 3 has been plotted. This figure shows the change in absolute ceiling in feet due to a one percent increase in any one of the four factors which determine Λ. For example, an airplane having an absolute ceiling of 50,000 ft., as determined from Fig. 2, would suffer a 520 ft. decrease in ceiling if it were subjected to a one percent increase in weight, while it would gain 335 ft. if the thrust horse power available were increased one per cent. These variations hold rather closely for small changes of the four factors, power, span, weight, and parasite drag. It is evident from the figure that the most important factors are the weight, span, and power, while parasite drag is of much less importance. The weight and span determine the induced drag of the airplane under given flying conditions.

The above conclusions are in distinct contrast to the previous conclusions regarding the relative importance of the factors governing the maximum speed and range of airplanes. In the latter two cases the parasite drag was the most important factor. It becomes quite obvious from these conclusions that an airplane designed for maximum ceiling must be quite different from one designed for maximum speed or range.

The problem of designing an airplane which is to break the world's altitude record is clearly one of obtaining the greatest aspect ratio for the wing and the greatest thrust horse power without allowing the weight to increase too greatly. The airplane should be kept reasonably clean aerodynamically but weight should govern the extreme to which the cleanness is carried.

Returning to Fig. 2, estimated values of Λ are given for the two most recent altitude record holders, the British Bristol 138a and the French

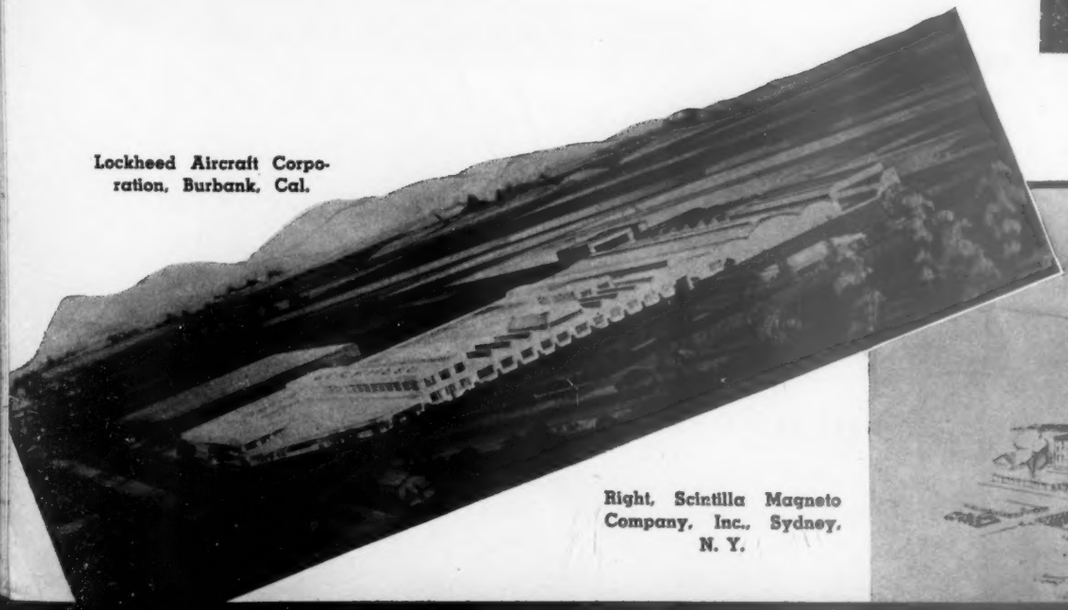
(*Turn to page* 75)

Above center: The British Bristol 138, present record holder. Below: The Potez 50 (French), which set the prior best record.

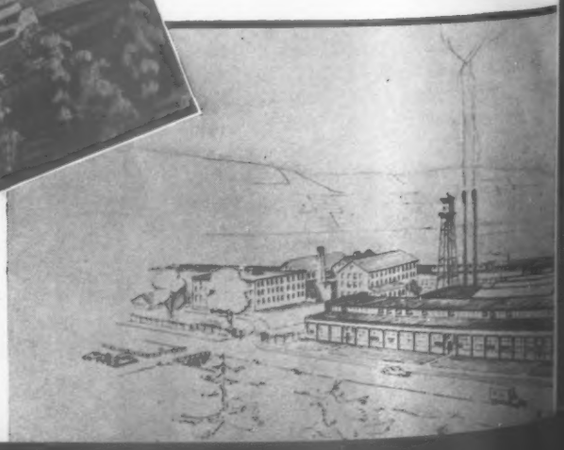
Left, The Glen L. Martin Company, Baltimore, Md.; Below, Consolidated Aircraft Corporation, San Diego, Cal.

Left, Hamilton - Standard Propellers Division, United Aircraft, Hartford, Conn.

Lockheed Aircraft Corporation, Burburbank, Cal.

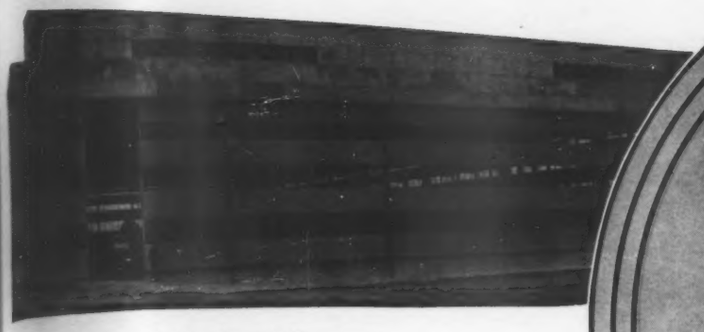


Right, Scintilla Magneto Company, Inc., Sydney, N. Y.

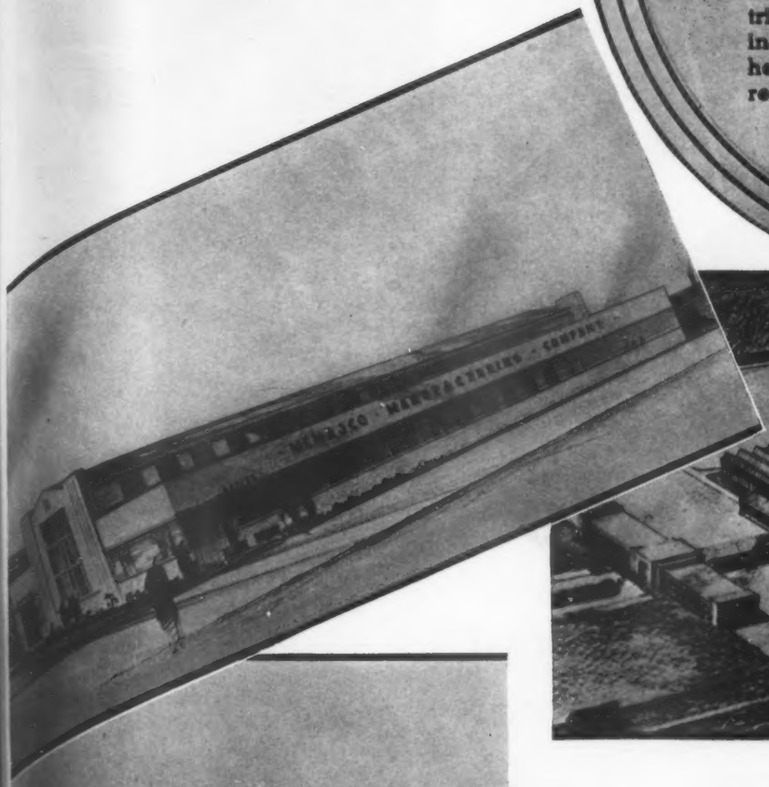


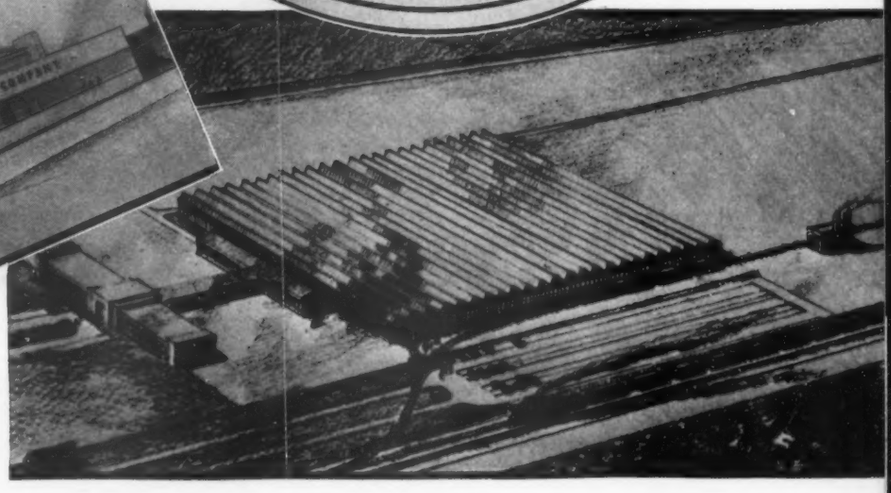
An Expanding Industry

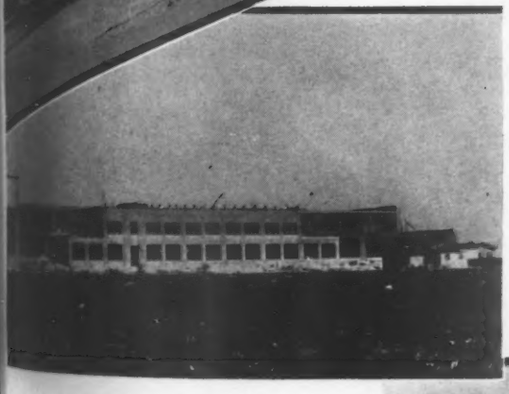
Free from the forced-draft conditions under which factories in many countries are working today, our aircraft industry is going through a period of healthy growth. These pictures show recent, or projected additions to many of our plants.



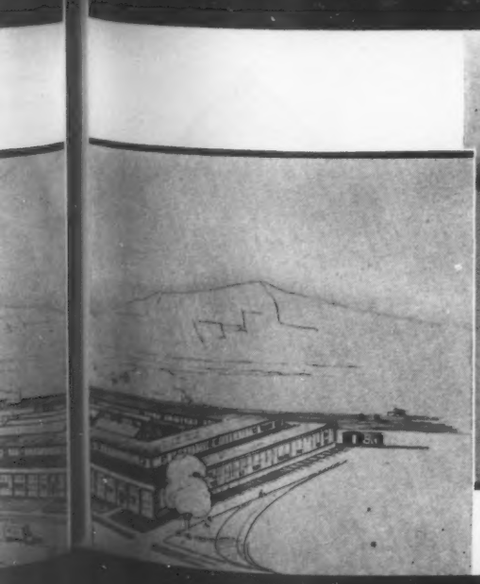
Boeing Aircraft Company
Seattle, Wash.







Left, Grumman Aircraft Engineering Corporation, Bethpage, L. I., N. Y.; Above, Menasco Manufacturing Company, Los Angeles, Cal.; Right, Bendix Aviation Corporation, Bendix, N. J.



Douglas Aircraft Company, Inc., Santa Monica, Cal.

Studebaker dealers around the country soon will add this flying automobile to their line.

Two in One

Waterman's W-5 Arrowbile offers a practical combination road car and airplane.

TEST FLOWN SUCCESSFULLY on Feb. 21 and publicly shown for the first time at the National Pacific Aircraft Show on March 13 at Los Angeles, the Waterman Arrowbile marks an important milestone in the development of private flying. Future historians may well rate the Arrowbile as the pioneer of a type of aircraft to revolutionize the use of small planes by the general public, for this unique hybrid auto-plane, incorporating a host of novel features, has proved thoroughly practical in extensive tests both as a road car and an airplane,—with the change from one to the other being effected in three minutes or less.

The Arrowbile was designed and built by Waldo Waterman, pioneer West Coast pilot (1909), member of the Early Birds. He has had extensive experience as a transport pilot and plane builder and has attempted to incorporate in the Arrowplane practical features based on his long experience and his ideal of what the private plane should be. Back of the Arrowbile is the curious "Whatsit" tailless plane of 1932 and the Arrowplane delivered to the Department of Commerce in 1935.

Other individual aircraft have been tailless, roadable and have had quickly detachable wings, two controls, automobile engines, and tricycle landing gears, but this is the first to incorporate all of these features in one practical vehicle. But with all its novelty features the chief bid for fame of the Arrowbile must rest on its dual nature, on its equal at-home-ness on the ground or in the air, on its practical ability to operate from home

Flying Equipment

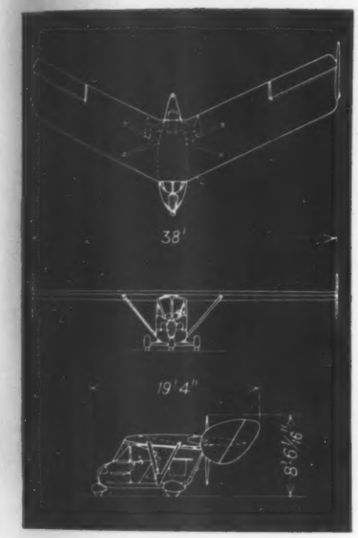
to airport and back again without sacrificing anything in the way of performance as an airplane.

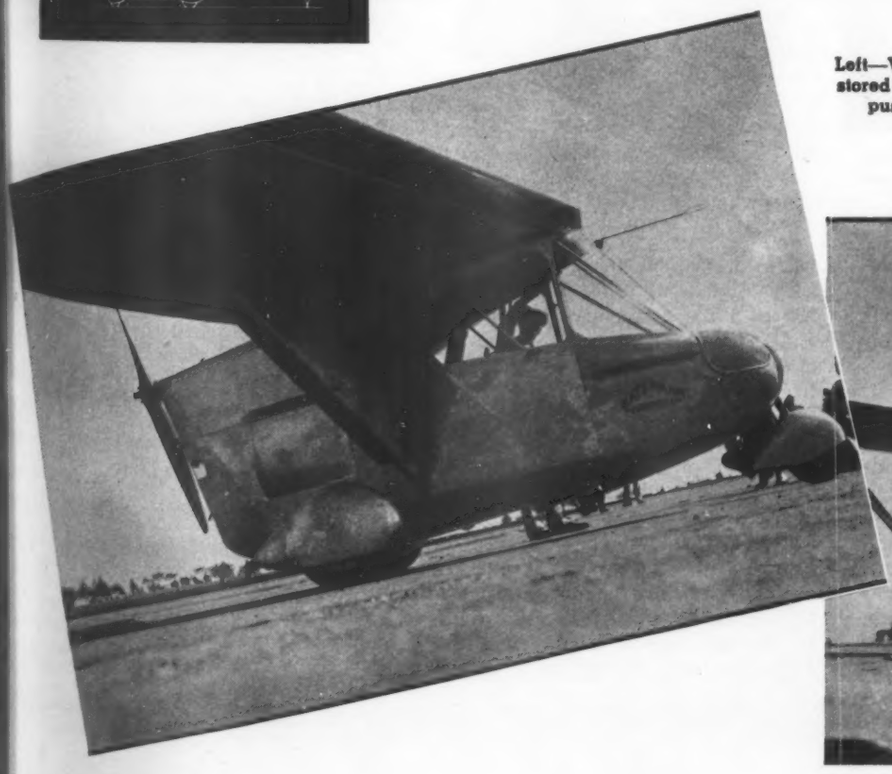
As a road car the Arrowbile would command attention even without provision for wings. Streamlined and with rear engine mounting, it follows latest automotive design trends. Licensed as a motorcyle in the state of California because of its classification as a three wheel vehicle, the machine provides comfortable accommodation for two people, scoots over the highway smoothly at speeds up to 70 m.p.h., has a reverse gear, brakes, horn, lights, rear view mirror, standard automobile engine, and no outward resemblance to an airplane except for the stationary propeller at the rear.

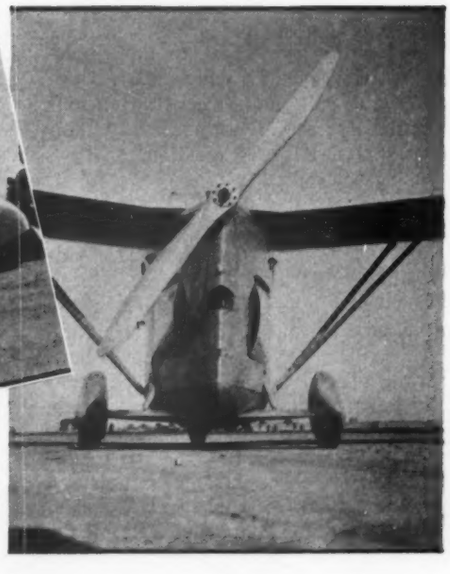
In a hangar equipped to mount the wings, the Arrowbile can be converted to an Arrowplane in three minutes or less. Wings lock on with foolproof attaching devices and as there is no tail the operation is quick and simple. As an airplane it has demonstrated quick takeoff, slow and short landings, and a top speed of over 115 m.p.h. Cruising speed is reported as 100-105 m.p.h. which is sufficient to meet the needs of the average private flyer. Range is 400 miles.

Even though it had no automobile characteristics the Arrowbile would be outstanding as a small plane for its safety features. Control has been simplified through linkage of ailerons and wing tip rudders so that the pilot turns the plane automatically with the wheel, and pushes or pulls the wheel control to descend or climb. With normal control arrangement it is said to be impossible to spin the plane and difficult to get it into a stall, as the plane normally seeks to recover even before the stall condition is reached. In taking off or landing the well recognized advantages of the tri-cycle landing gear are an added safety feature eliminating fear of ground loop or nose over. The plane may be flown in, or stalled in to the ground as the long travel landing gear has been designed and built to take the shocks of abnormal landings by novice or inexpert pilots.

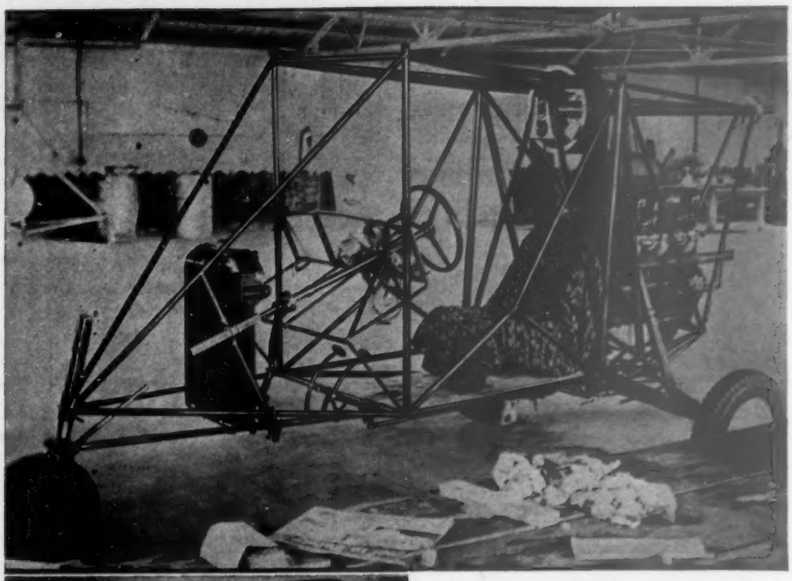
With ATC now pending on the Arrowbile it is reported that the converted 100 hp. Studebaker six cylinder automobile engine with which it is powered has successfully passed the required 150 hr. of test running. Ten units are now under production and when it is noted that, with all its unique features, the Arrowbile still retails at less than $3,000, including night flying equipment starter and generator, it can be appreciated that the influence of this novel plane is likely to be widely felt in the private plane market. Because of its strongly automotive background an attempt to sell and service the Arrowbile through established automobile agencies is now being considered. Airports would be licensed to operate wing storage and attaching equipment, and the possibility has been suggested that the Arrowbile will be sold to customers as a car, the wings being rented as needed from any convenient airport. First five Arrowbiles from the pro-



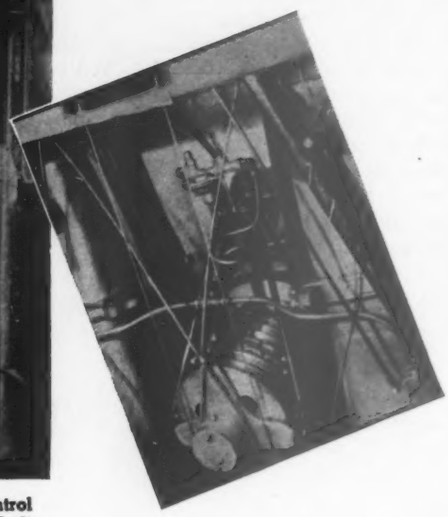




Left—Wings are detachable and are stored at the airport. Below—The pusher propeller installation.



The welded steel tube structure of the Arrowbile.



Above—The instrument board and control wheel. Right—Multiple pulley for belt drive.

duction line are going to the Studebaker Corporation, which plans a nation wide sales and demonstration tour in the interest of auto sales by their national dealer organization.

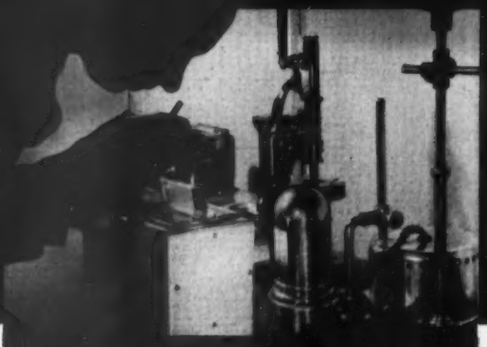
IN DESIGN the Arrowbile may be classed as a two place side by side cabin monoplane of high wing, semi-cantilever, strut braced type, tailless. Construction is principally of metal, the nacelle being of welded steel tubing structure covered with dural sheet, while the wings are of two spar construction with spars of routed spruce, formed dural ribs, and steel tube drag bracing, cloth covered. Of particular interest is the engine installation and mounting of accessories. The Studebaker engine is standard except for use of a stock high compression head, special intake and exhaust manifolds, use of three automotive carburetors, and a large oil pan. The engine is mounted in such a way that most of the weight is slung directly to the two main landing wheel struts, removing landing loads from the fuselage framework proper. Drive to the overhead propeller shaft is by means of multiple groove pulleys and, six vee belts, the pulleys being spaced on about 38 in. centers. Engagement is made by raising the upper shaft to tighten the belts. Drive to the wheels is through special chain belts for forward speed, or by direct friction for reverse, although a gear box may later be substituted for this present feature of the design. The engine carries a muffler for street operation, a cut-out being used for flying. Cooling is by a standard Studebaker radiator, mounted forward of the main cabin and taking cooling air from the nose through a tunnel and exhausting from the rear of the nacelle. Wheels and shock struts are of Waterman design and construction, brakes being a standard Bendix automotive product. Firestone 12 x 4.5 in. industrial tires are used on the rear wheels, and 8 x4 in. on the front wheel. Headlights are standard except that the bulbs are ranged to throw the main beam at a downward angle for landing. A standard automobile battery is carried in an accessible position at the rear, the engine carrying the automotive electric starter and generator as mounted at the Studebaker factory. Controls include a horn, parking brake, neutral lever on the dash, clutch pedal for the left foot with reverse by pushing the pedal in and forward speed when the pedal is released. The brake is at the right foot, as is the floor type foot accelerator. An automotive speedometer is carried, as are engine oil pressure and temperature gauges, ammeter, fuel gauges and water temperature indicator. A rear view mirror is standard equipment, as in an auxiliary hand wobble pump consisting of an ordinary automotive engine driven type fuel pump equipped with a handle which permits pumping at a rate considerably in excess of engine requirements.

Specifications:

Span	38 ft.
Length	19 ft. 4 in.
Height	8 ft. 8 in.
Landing gear tread	5 ft. 10 in.
Wheelbase	9 ft. 2½ in.
Landing gear wheel travel	
front	8 in.
rear	10 in.
Road gear ratio	3.6 to 1
Propeller gear ratio	1.94 to 1
Wing area	264 sq. ft.
Engine	Studebaker 6–100 h.p. at 3400 r.p.m. (70 octane standard automotive fuel required.)
Fuel capacity	24 gal.
Wing loading	9.47 lb./sq. ft.
Power loading	25 lb./hp.
Gross weight	2500 lb.
Weight empty	1940 lb.
Useful load	560 lb.
Weight of car (without wings)	1480 lb.
Wing angle of incidence	root–5 deg. tip–1½ deg.
Wing chord	84 in.
Wing sweepback	25 deg.
Wing section	N.A.C.A. 23012
Top speed	115–120 m.p.h.
Cruising speed	100–105 m.p.h.
Cruising range	400 miles
Landing speed	40–50 m.p.h.
Road speed as automobile	70 m.p.h.

A MILLION TIMES A SECOND

Sawing the crystal blanks at the proper angle is the first important step.

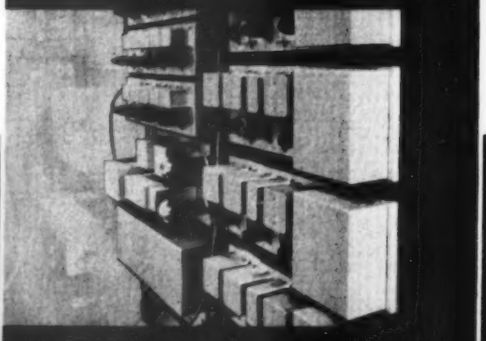


From the raw product to the finished crystal. On the left are various formations of raw quartz as mined in Brazil. Next are shown marked inferior sections and the perfect cut blanks. On the right you see various sizes of finished ground crystals and types of holders.

Optical measurement equipment for determining flaws otherwise invisible to the naked eye.

tual physical motion so fast it can ver be seen . . . yet, one million es a second is *not* unusual! Many ndix Piezo Electric Crystals vibrate rapidly as *fifteen million* times a cond (15,000 KC) and their accuracy controlled within unbelievably small limits . . . Because of this redible exactness and precision under all temperature condi-s, Bendix Crystals control frequencies throughout the world. wonder of the Bendix Crystal as the ever-accurate controlling or of thousands of transmitters is a tribute to the experience, owledge and craftsmanship of Bendix engineers . . . and is ical of the advanced development and consistent performance ll Bendix Products.

Measuring the finished blanks on micrometer for final check-up on frequency.



Rear view of exclusive Bendix frequency decade and standard, used for rapid setting and checking of crystal frequencies.

Direct All Correspondence to

x Radio Corporation, 9th and Kearny Streets, N. E., Washington, D. C.

BENDIX

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YORK, WASHINGTON, DAYTON, CHICAGO, OAKLAND

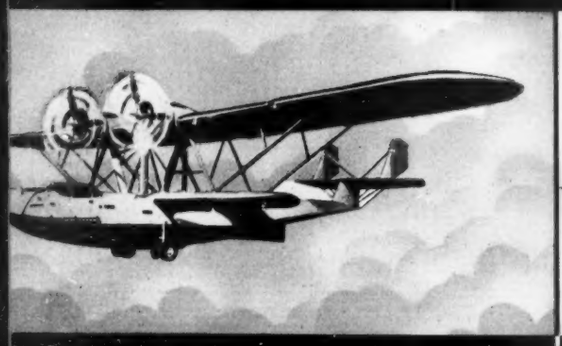
SUPPLANTING THE SOUTHERN CRO

Ever since Schouten led the way through Southern Seas arou perilous Cape Horn in 1616 the famous Southern Cross has gi en bearings and direction to anxious mariners. ★ Today Bend engineers have conquered the uncertainty of the heavens wi precise, unfailing instruments that keep "ships of the air" on true and accurate course. Bendix has just equipped six diffe ent types of planes for the Air Force of the Argentine Nav with Bendix Direction Finders and other radio equipme The instruments for each type plane were especially designed and constructed by Bendix engineers whose experience and knowledge defined the necessary requirements.

Bendix Aircraft Radio equipment is used only in these planes for the Argentine gove ment, but also for the U. S. Army; Navy Coast Guard; Dept. of Commerce; Smithsoni Institution; United Airlines; American Airli TWA Airlines; Columbian Government, That is because previous results have sho Bendix Aircraft Radio products superior design, construction and performance.

Type of Bendix Equipment used in these planes now in Argentine Naval Service.

CONSOLIDATED
Transmitter, Receiver, Direction Finder, Interphone.



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DC-4 Details

Douglas releases first information on long-planned 4-engined project

AFTER YEARS OF PLANNING and detailed engineering work, and months of speculation as to the features to be incorporated, preliminary details of the new Douglas DC-4 forty passenger four engined transport have been announced by Donald W. Douglas. Particular emphasis has been placed on the cooperative engineering background against which the plane has been developed. With experienced engineers of TWA, United Airlines, American Airlines, Inc., Pan American Airways, and Eastern Airlines cooperating with the engineering staff of the Douglas Company, the development of this plane has brought together a greater concentration of qualified engineering brains than has ever before been concentrated on a single aviation problem in the history of the industry.

In general proportions the DC-4 closely resembles the DC-2 and DC-3 models. Fuselage and wing, although larger, are similar, — the body retaining the typical Douglas characteristics, and the wing incorporating the marked leading edge sweepback and straight trailing edge. There, however, resemblances cease. Aside from the obvious four engines in place of two, the three points that arouse primary interest are (1) the tricycle landing gear, (2) the three rudder tail, and (3) the marked dihedral (9½ deg.) of the horizontal stabilizer. The tricycle gear, aside from its recognized safety features, will provide level landings as an added comfort feature,—especially important at night when landings and takeoffs may be made without awakening sleeping passengers. The unique tail design has presumably shown improved stability characteristics in wind tunnel testing, although no official comment on this point is yet obtainable.

General features of construction of the DC-4 are quite similar to those of the all-metal stressed skin DC-2 and DC-3 transports. Landing gear is fully retractable for all three wheels.

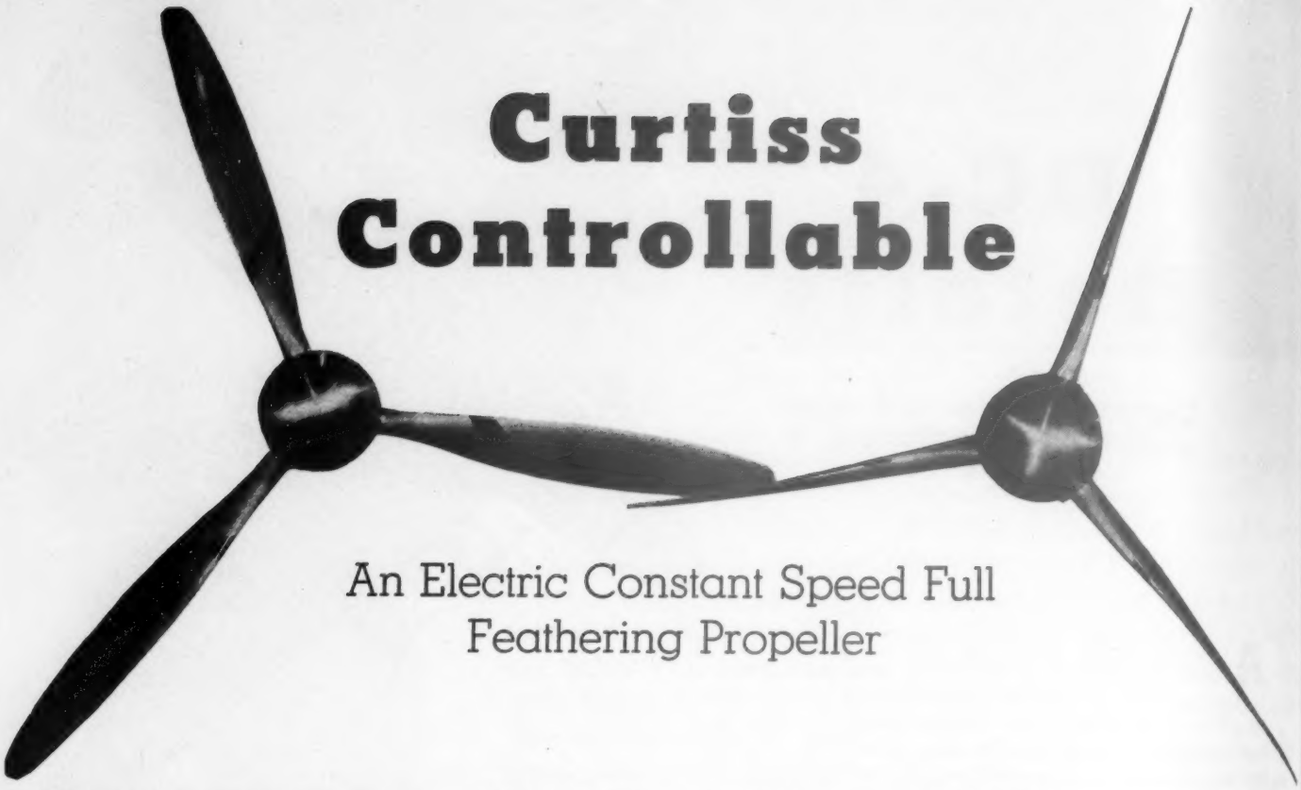
Inboard engines toe out 2½ deg. and outboard engines 6 deg. Flaps are of generous size and conventional design except that the wing flaps each extend partially across beneath the fuselage to eliminate the third panel heretofore used. A belly cargo compartment beneath the passenger cabin is provided, speeding handling of cargo, simplifying balance of load.

Cabin accommodations in the DC-4 literally reach a new "high," with a floor-to-ceiling distance of 89½ in., or approximately 7½ ft. Inside width is 128 in., or more than 10 ft. As a day plane roomy accommodation is provided for 40 people, and as a sleeper for 30, the cabin making

(*Turn to page* 78)

Flying Equipment

Curtiss Controllable



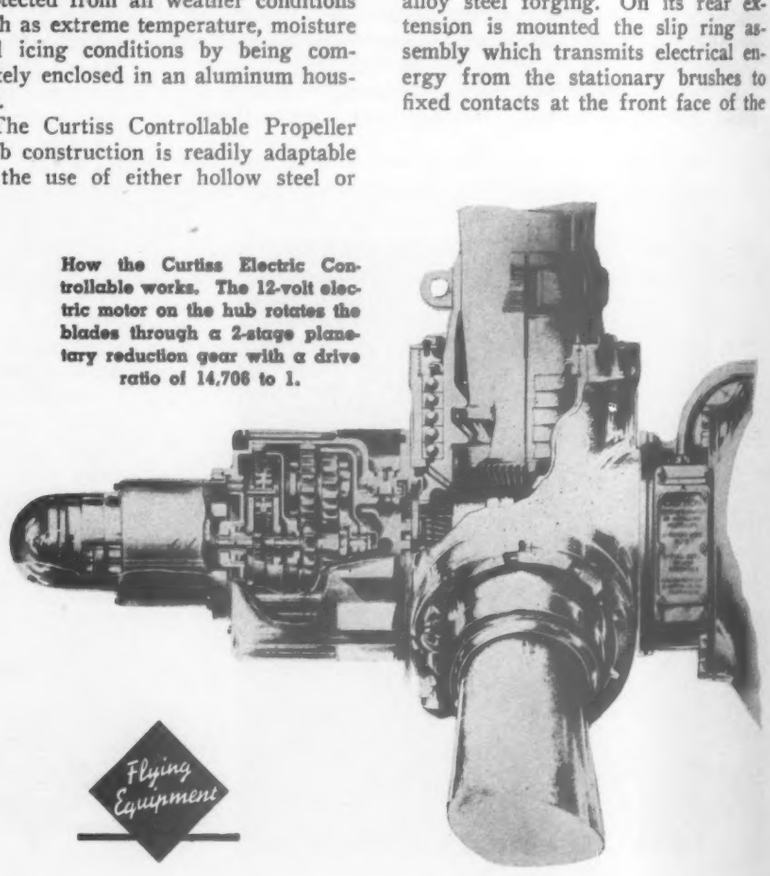
An Electric Constant Speed Full Feathering Propeller

TRENDS IN MODERN AIRCRAFT DESIGN toward multi-engine types supercharged for high altitude operation have imposed new demands upon controllable pitch propeller equipment. To secure the best operating conditions with a minimum of attention from the pilot, constant speed control is essential. To meet the requirements of increased speed range, a wide operating range of blade angles is necessary. To prevent possible further damage to the engine and airplane due to "windmilling" in the event of failure of one of the power plants, and to secure a maximum of performance from the remaining power it is highly desirable that the propeller be capable of attaining blade angles of 85 to 90 degrees or of being "feathered."

The Curtiss Electric Constant Speed Full Feathering Propeller has been developed to meet all these requirements. The electrical method of control has a flexibility which permits of either constant speed or selective manual control in the same installation. Under selective manual control, any blade angle between the low pitch limit setting and the "feathered" angle may be obtained and maintained independent of engine condition, at the will of the pilot. At any operating condition, propeller pitch may be fixed for magneto checking, mixture adjustment and performance checking. The hub construction and blade retention used impose no limitation on blade angle movements as great at 120°, which is sufficient to cover all conceivable requirements on land, water or in the air. The completely enclosed pitch actuating mechanism is protected from all weather conditions such as extreme temperature, moisture and icing conditions by being completely enclosed in an aluminum housing.

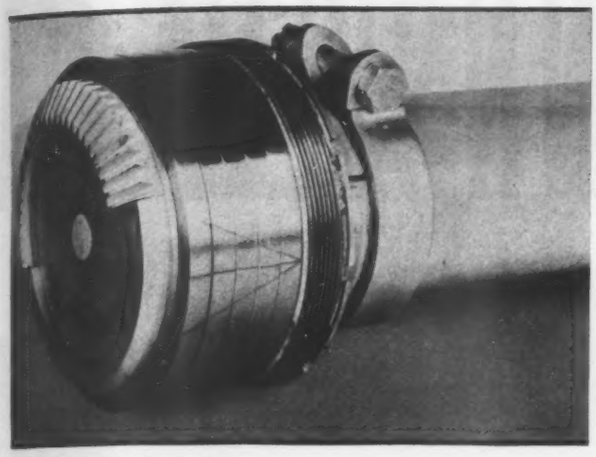
The Curtiss Controllable Propeller Hub construction is readily adaptable to the use of either hollow steel or standard detachable type aluminum alloy blades.

The hub proper is of the one piece type, machined from a high strength alloy steel forging. On its rear extension is mounted the slip ring assembly which transmits electrical energy from the stationary brushes to fixed contacts at the front face of the

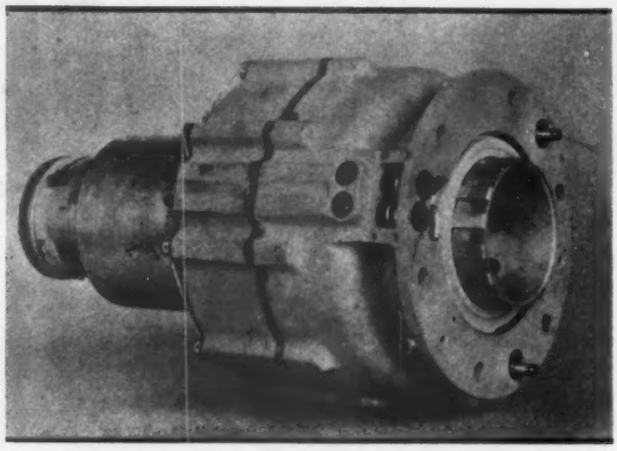


How the Curtiss Electric Controllable works. The 12-volt electric motor on the hub rotates the blades through a 2-stage planetary reduction gear with a drive ratio of 14.706 to 1.

Flying Equipment



Details of blade end showing gear sector.



Motor and gear assembly. Brake on extreme right.

hub. Suitable crankshaft nut, adapter and locking means are provided for ready installation on the standard propeller shaft.

THE FIXED BRUSH ASSEMBLY consists of a pair of spring loaded carbon composition brushes for each slip ring, mounted in a block of insulating material and supported by a light alloy casting bolted to the thrust cover of the engine nose. This casting completely houses the electrical parts and serves to seal and protect the parts from the effects of moisture, dust and other foreign matter. To insulate against shock and vibration the brush block is supported in its housing on special rubber bushings. Leading into the housing is a standard conduit fitting.

The centrifugal load of the blade is carried from a shoulder at the butt end, through a stack of angular contact bearings to the blade nut, where special buttressed threads transfer it to the hub barrel. The one bearing at the inner end is reversed for taking the "preload" when the blade nut is tightened to eliminate play from the bearing stack.

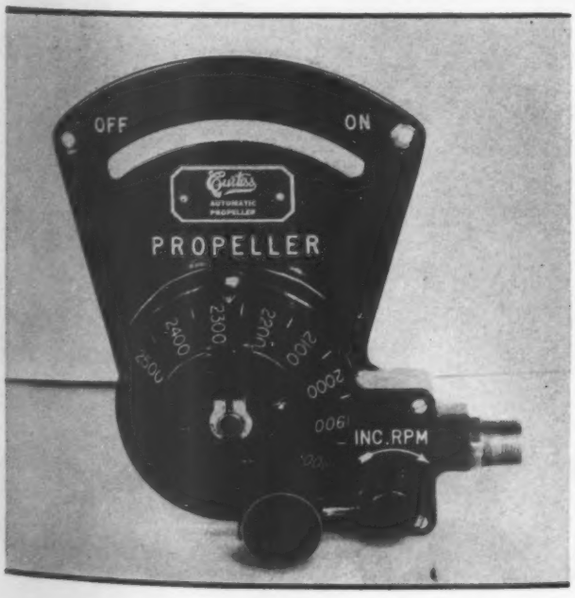
When hollow steel blades are used, the bearings are mounted directly on the accurately turned shank of the blade. For standard shank aluminum alloy blades, a split steel sleeve with standard clamp is provided for mounting the bearings.

PITCH change is effected by means of a power unit, as shown on p. 38.

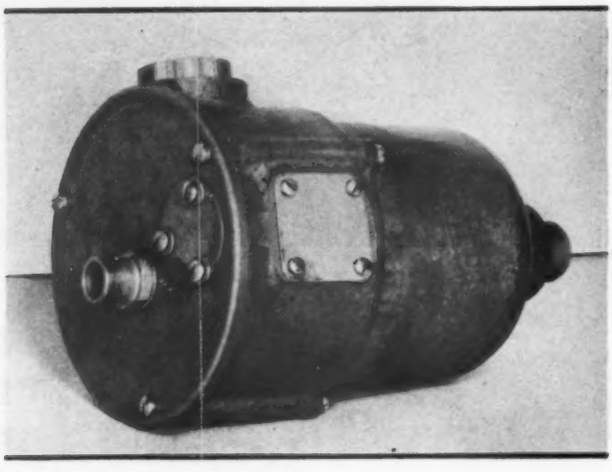
The unit construction of the power unit, electric motor, speed reducer, slip ring and brush assembly greatly facilitate the inter-change of parts between propellers and the replacement of parts with a minimum loss in operating time.

The normal pitch range of the blades is controlled by electrical cut-out switches operated by a cam on the shaft with the power bevel gear. This range is usually made to cover the full requirements of normal flight, from take-off to maximum gliding descent speed. The number of teeth on the power gear and the number of splines on the power gear drive shaft differ, so that by a simple process of indexing, the range of the limit switches may be readily shifted to properly accommodate the take-off rating of various engines. Blade angles outside the normal flight range such as feathering are obtained at the will of the pilot by means of the manual control switch which bi-passes the cut-out limit switch.

(*Turn to page* 73)



Left, governor control unit to be mounted in cockpit; right, the governor maintains engine speed within 3-5 r.p.m.



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TEXACO

Aviation Products

Lycoming Announces Refinements—

Advanced series R-680-D engines bring transport engine features to medium horsepower class

LYCOMING has just announced a new series in which are incorporated a host of detail refinements, although all basic features of the R-680 model are retained. Features of the new engine are based on the aggregate experience of more than one hundred million miles of flight in the hands of every type of operator. Certain airlines have reported many Lycoming engines with more than 5,000 hours flying service and still in use.

Most notable refinement of the D series is the greatly increased cooling fin area, providing approximately 20 sq. in. of fin for each cubic inch of engine displacement, or a total of more than 90 sq. ft. of cooling fin area for a 260 hp. engine. The increased fin area, together with closer fitting cylinder air baffles and rear exhaust ports, lowers series D operating temperatures and achieves more uniform cooling. Additional cooling is obtained in the medium compression engines by providing ribbed pistons for them as well as for the high compression models.

Other refinements include the use of two valve springs on all valves, resulting in higher spring pressures and improved valving; an improved 13 spline nitralloy accessory drive shaft driven by a removable bushing in the rear of the crankshaft; and placing of the rear spark plugs closer to the top of cylinder heads, promoting cooling and combustion.

A new piston ring type impeller oil seal is now incorporated, securing positive oil sealing under all operating conditions. An oil pressure relief valve assembly check valve prevents oil from entering the engine from the oil tank when the engine is not in operation. The engine oil pump is operated at reduced speed, and an oil seal at each distributor furnishes protection from rear crankcase oil vapors. Completely automatic valve gear lubrication is standard, with particular care to insure complete drainage of each rocker box during idling periods on the ground and when the engine is stopped. New enclosed rocker boxes and one piece rubber sealed push rods makes the automatic lubrication feature completely oil tight. By complete elimination of manual lubrication, operators of the new D series Lycoming may fly from sixty to seventy hours without maintenance attention to the engine.

All accessories are now so grouped as to provide the most complete accessibility; standard equipment including: one dual type magneto with two Scintilla distributors, starter, generator, fuel pump, vacuum pump, and tachometer drives. Other equipment furnished with each engine includes Stromberg NA-R7A carburetor, built-in Cuno oil filter, pressure type cylinder baffles, booster coil connection to left distributor, individual radio shielding, fuel priming connections to top three cylinders, and propeller attaching parts. The AN Standard No. 20 crankshaft end permits the installation of either fixed or controllable propellers of Lycoming mechanically operated type or Hamilton-Standard hydraulic. Provision for controls of either type are made entirely within the front crankcase section. Specifications of the Lycoming R-680-D Series are:

Type.....Direct drive, single row, radial, air cooled, nine cylinders		
Bore.....4⅜ in.	Stroke.....4½ in.	
Piston displacement.....	680.4 cu. in.	
Compression Ratio.....	5.5 to 1	6.5 to 1
Rated speed for takeoff with Controllable propeller.....	2300 r.p.m.	2300 r.p.m.
Rated Normal speed with fixed pitch propeller...	2100 r.p.m.	2000 r.p.m.
Rated brake horsepower for takeoff with Controllable propeller.....	245 h.p.	260 h.p.
Rated normal brake h.p. with fixed pitch propeller.....	225 h.p.	240 h.p.
Fuel required (Octane no.).	72	80
Diameter of mounting bolt circle...		19½ in.
Number of mounting bolts.....		8
Size of mounting bolts.....		⅜ in.
Overall diameter of engine.....		43.5 in.
Overall length of engine.....		37.04 in.
Average engine weight, complete...		516.6 lb.
Includes weight for following:		
Radio shielding.....		8.7 lb.
Generator drive.....		1.13 lb.
Fuel pump drive.....		1.6 lb.
Vacuum pump drive.....		0.7 lb.

Fuel consumption — Maximum at Cruising, 0.52 lb. /bhp/hr.

Propeller shaft end—splined type.—AN STD No 20

Electric Control—

Is combined with throttle control handle in order to simplify pilot's selection of propeller blade angle

TO REDUCE THE COMPLEXITY of control Lycoming has developed a pitch control for propellers that is incorporated in the throttle handle and so permits the pilot, with one hand, to set his engine speed for any desired condition of take-off, climb, or cruising, and simultaneously set the propeller blade angle. Fore and aft movement of the throttle handle operates the engine control as before, and turning the throttle handle knob clockwise or anti-clockwise operates an electric control which increases or decreases the propeller blade angle.

The electric solenoid unit used is installed on the adapter on the front of the engine. A switch housing is mounted in conjunction with the throttle handle. When the throttle is twisted to close one of the two switches, the solenoid shifts a stationary control worm into engagement with the gear train in the rotating propeller, thus changing the blade angle. Release of the throttle handle when the desired blade angle has been reached returns the stationary worm to neutral, out of engagement with the gears in the rotating propeller. Thus, as long as the throttle handle is held in a clockwise or anti-clockwise position a decrease or increase of the blade angle is secured within the range of the propeller, and on release of the throttle handle knob it will automatically return to neutral.

Flying Equipment

Since this Famous Flight 10 YEARS AGO

Transcontinental & Western Air
Douglas DST Skysleeper
Powered By Wright Cyclones

American Airlines
Douglas "Flagship" Sleeper
Powered By Wright Cyclones

Eastern Air Lines
"Great Silver Fleet"
Powered By Wright Cyclones

In the brief span of ten years since Colonel Charles A. Lindbergh made the historic non-stop, solo flight from New York to Paris, in his Wright Whirlwind-powered "Spirit of St. Louis," air transportation has had a very phenomenal growth.

Passenger traffic in the United States alone has increased from a few thousand airline passengers in 1927 to over a million in 1936. Plane miles flown over America's leading air routes have increased from a few hundred thousand miles in 1927 to over 64,000,000 miles in 1936—43½% of the world's total commercial transport flying.

Wright aircraft engines have played a vital part in the tremendous growth of air transportation throughout the world. Today Wright Cyclone and Whirlwind engines not only power the majority of the leading airlines of the United States, but the fastest airline equipment operated by leading airlines throughout the world.

Famous Cyclone-powered Lindbergh Flights

1931—Colonel and Mrs. Charles A. Lindbergh's flight from Washington, D. C. to Tokyo, Japan in a Cyclone-powered Lockheed Sirius Monoplane, equipped with floats.

1933—Colonel and Mrs. Charles A. Lindbergh's survey flight for Pan American Airways, in their Cyclone-powered Lockheed Sirius, to Europe, Africa, South America and return. On this flight the Lindberghs visited 31 countries and colonies—spanned both the North and South Atlantic Ocean—covered a total of 30,000 miles!

Pan American Airways
Douglas DC-2 Airliner
Powered By Wright Cyclones

K. L. M. (Royal Dutch Airlines)
Douglas DC-2 Airliner
Powered By Wright Cyclones

Swiss Air Lines
Douglas DC-2 Airliner
Powered By Wright Cyclones

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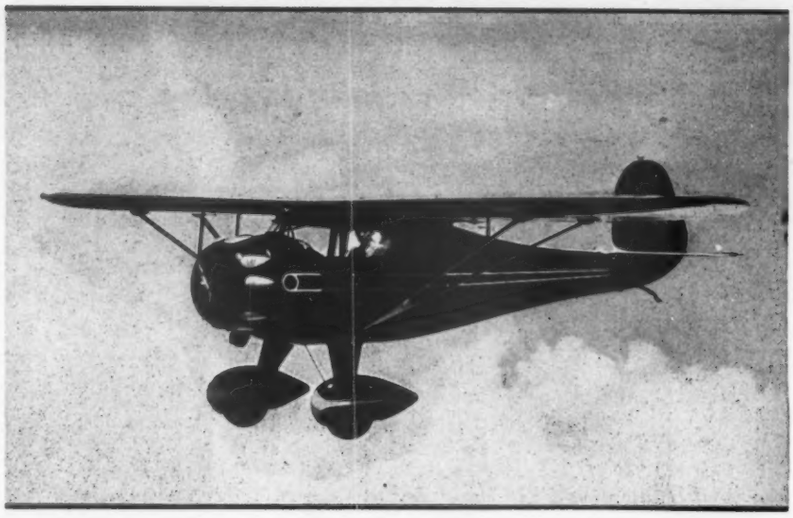
Monocoupe for 1937—

Improved performance for latest version of model 90-A

THOUSANDS OF MEN have been introduced to aviation through the famous line of Monocoupes. Detailed refinements and improved performance have further established the model 90-A for 1937 as one of the leading utility airplanes of the country. Retaining all of the well known advanced features of the high wing two place side-by-side strut braced monoplane, the newer Monocoupes, with Lambert R-266 engine and flaps show a top speed of 130 m.p.h., cruising speed of 110 m.p.h. and landing speed of 40 m.p.h. New windshield and cowl improves vision from the cabin, the seats are larger, cabin is wider, cushions are deeper, and the door is roomier. Standard equipment of the DeLuxe model includes wheel pants, N.A.C.A. cowling, wing flaps, parking brake, metal propeller, clock, compass, altimeter, airspeed indicator, tachometer, oil temperature and pressure indicators, 6.50x 10 semi-balloon tires, dual controls, fire extinguisher, tail wheel, navigation lights, first aid kit, tools and log book.

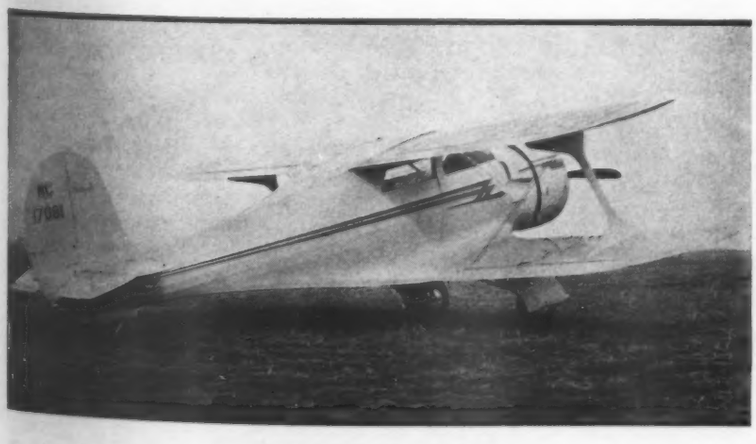


Monocoupe in flight

Beechcraft Cruises at 235—

Powered with Wasp Jr. SC-G engine, model D-17 outruns transports

SURPASSING IN TOP SPEED AND CRUISING SPEED the performance of any transport plane now in service, the new Beechcraft Model D-17 powered with the Pratt & Whitney Wasp Jr. SC-G engine would stagger the imagination were it not for the known performance of its predecessors. With a cruising speed of 235 m.p.h. at 13,500 ft. using 365 hp. and a landing speed with flaps of 50 m.p.h., the plane shows a remarkable speed ratio. Among important new refinements on the D-17 are a new wing section, cantilever tail group, and new balanced flaps attached to the lower wings. Improved shock absorbers are designed to take great landing loads and provide smoother taxiing. The constant speed propeller makes maximum cruising performance possible and the cabin has been enlarged and rearranged to provide exceptional room for four passengers and pilot. The fuselage has also been lengthened and the tail wheel set back to promote smoother ground operation over rough spots. Specifications as released by the Beech Aircraft Corp., Wichita, are: Span—32 ft.; Length—26 ft., 15/32 in.; Height—8 ft.; Wing area —267.5 sq. ft.; Power loading—7 lb./hp.; Wing loading—15.7 lb./sq. ft.; Empty weight—2,553 lb.; Gross weight—4,200 lb.; Baggage allowance —125 lb.; Fuel capacity—120 gal.; Oil Capacity—7½ gal.; Performance: Cruising speed—235 m.p.h.; Landing speed—50 m.p.h. (with flaps); Service ceiling—30,000 ft.; Rate of climb —2,500 ft./min.; Cruising range—variable. Standard engine and flight instruments: Cambridge Exhaust Gas Analyzer, Cylinder head temperature indicator, manifold pressure indicator, oil pressure gauge, oil temperature gauge, tachometer, ammeter, compass, altimeter, air speed indicator, bank and turn indicator, rate of climb indicator, Moonglow instrument lights. Standard equipment: Electric starter, generator, storage battery, engine driven fuel pump, hand wobble pump, flop-over control column, cabin heater, double firewall, two cabin ventilators, electrically operated wing flaps, electrically retractable landing gear, constant speed propeller, P & W Wasp SC-G Jr. engine.



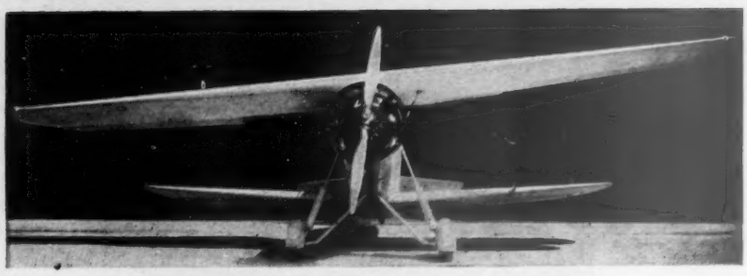
The D-17 Beechcraft (Wasp Jr.)

With Foreign Builders

Interesting Information on New Planes From Abroad

FOREIGN AIRCRAFT BUILDERS from all quarters of the globe continue to demonstrate the originality and independence which so often characterizes their work.

Among the more unusual new developments is the Italian Jona J-6 built by Alberto Jona, of Milan, Italy. The Jona J-16 airplane is a single



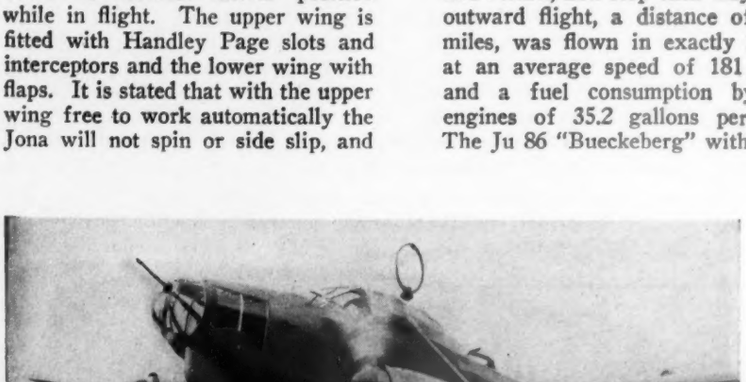
The variable dihedral Italian Jona J-8.

engine cantilever wing sesquiplane of normal construction and appearance. Both wings are of wood construction with wood covering, while the fuselage is of welded steel tubing, cloth covered. Fitted with a Fiat A-54 seven cylinder engine developing 140 hp. at 2100 r.p.m. the Jona has a top speed at sea level of approximately 125 m.p.h. It is in the control system that the Jona differs from the ordinary, as the entire upper wing is hinged laterally so that it is tiltable automatically or by the pilot, while the relative incidence to the fuselage remains the same. It is said that the machine is flown by the stick alone, and that the rudder is unnecessary except for ground maneuvers, and is normally locked in flight. Normal use of the ailerons on the part of the pilot serves to tilt the wing, or it will tilt automatically when the wing changes from its normal lateral position while in flight. The upper wing is fitted with Handley Page slots and interceptors and the lower wing with flaps. It is stated that with the upper wing free to work automatically the Jona will not spin or side slip, and the automatic lateral control simplifies piloting in bad atmospheric conditions. A simple hydraulic gear is used for locking the top wing for normal flight or aerobatics.

German aircraft builders have recently contributed two advanced types, one civil and the other military. The Junkers Ju 86 equipped with two Junkers Jumo engines was described in AVIATION for August 1936. Since that time a number of these machines have been placed in regular airline service, the first example of Deisel powered new production planes being so adopted and a further reminder of Diesel potentialities and of German leadership in this field. Unusual proof of the reliability of such Diesel equipment, and of its efficiency for operation over long routes was given by the recent flight of a Jumo powered Junkers from Dessau to Bathurst and return, non-stop each way. The outward flight, a distance of 3,625 miles, was flown in exactly 20 hr., at an average speed of 181 m.p.h. and a fuel consumption by both engines of 35.2 gallons per hour. The Ju 86 "Bueckeberg" with Junkers Jumo 205 heavy-oil engines provides roomy accommodation for ten passengers and baggage in addition to the two pilots. It is reported that several of these planes are shortly to be placed in the Germany-South America mail service, flying the South Atlantic non-stop.

An interesting military development is the new Focke-Wulf twin engine observation and bombardment training plane, which is capable of light military duty but was designed primarily for the training of pilots for larger and faster planes. Designated as Focke-Wulf Fw 58 B "Weihe" the plane is of low wing design with a semi-cantilever wing and retractable landing gear. Construction is of mixed type with wood wing and steel tube fuselage, cloth covered. Power is supplied by two Argus inverted V8 engines Model As 10 C developing 240 hp. each, similar to the engine used in the Focke-Wulf flown by Gerd Achgelis at Los Angeles during the 1936 National Air Races.

Wings of the Focke-Wulf "Weihe" are sharply tapered and are braced to the fuselage by a single strut from each engine mount to an internal tripod structure in rear of the pilot cockpit. The forward mounting of the horizontal stabilizer characteristic of many recent German planes is a distinguishing feature of the "Weihe". A crew of four is normally carried, consisting of pilot, co-pilot and radio operator, machine gunner in the rear turret, and machine gunner and bomber in the forward turret. Complete equipment for blind flying and two way radio communication is carried, making possible extensive flight and tactical problems for simultaneous training of the entire crew. Performance figures are not available.



Focke-Wulf Fw 58B "Weihe".

A CORRECTION

THROUGH TYPOGRAPHICAL ERROR a line was transposed in the Specification Table on Page 70 of AVIATION for April. Below is the corrected order for Specifications No. 158-161, inclusive. By cutting out this strip and pasting it over the original Specifications No. 158-161 the correction will be made. The order of appearance on the original Page 71 is correct as it stands.

158	Sikorsky Aircraft	S-42-B		592		CMF	37	4 Pwh	3,000	7,000	1,276	1,200	168.0	138	188	7,000	163	7,000	65		
159	Sikorsky Aircraft	S-43		593		CMA	18	2 Pwh	1,500	7,000	400	775	84.0	138	190	7,000	166	7,000	65		
160	Viking Flying Boat Co.	OO-1		360		OBF	4	Wr Ww	250	S.L.	60	390	14.0	84	104	S.L.	88	S.L.	48		
161	Seversky Aircraft Corp.	Sev.-2PA		Exp		CMA	2	Wr Cy	850	5,800	30 160	850	42.0	108	250	7,000	220	9,000	68		

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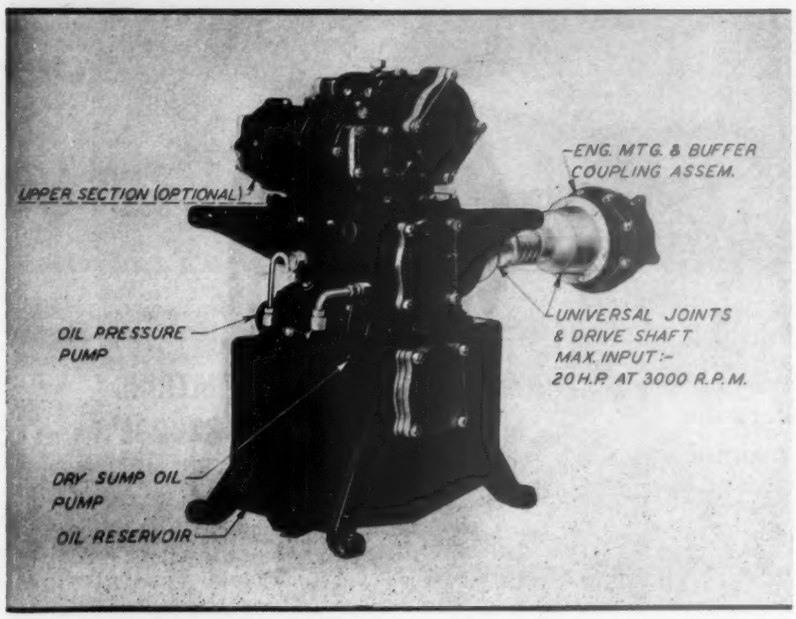
Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment


UPPER SECTION (OPTIONAL)
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OIL PRESSURE PUMP
UNIVERSAL JOINTS & DRIVE SHAFT MAX. INPUT:- 20 H.P. AT 3000 R.P.M.
DRY SUMP OIL PUMP
OIL RESERVOIR

Drives provided by Romec Gear Box. (1), Vacuum pump mounting "A" 2.5 hp. at 3,000 r.p.m.; (2), Fuel pump mounting 1 hp. at 2,000 r.p.m.; (3), De-icer pump mounting "A" (Gen. type). 5 hp. at 3,000 r.p.m.; (4), Vacuum pump mounting "A". 2.5 hp. at 3,000 r.p.m.; (5), Accessory mounting 5 hp. at 1,800 r.p.m.; (6, 7), Gen. mounting 5 hp. at 3,000 r.p.m.; (8), De-icer pump mounting "A" (Gen. type) 5 hp. at 3,000 r.p.m. NOTE: "A" denotes oil pressure lubrication through mtg. pads.

Accessory Gear Box—

Romec develops single drive unit to provide for engine accessories

ENGINE DESIGNERS HAVE BEEN SITTING UP LATE nights devising ways and means of providing accessory drives for all the gadgets that must get their power from the engine. Each new device requiring a separate drive increases the likelihood of secondary mechanical failure of the power plant.

To simplify the problem the Romec Pump Co. (Elyria, O.) has designed an accessory drive gear box which groups all the necessary distributing mechanism in a single unit outside the engine crankcase. The Romec Composite Gear Box is remotely driven and contains eight power outlets for such accessories as automatic pilot, retractable landing gear, wing flaps, navigating instruments, de-icing equipment, vacuum pumps and fuel pumps. The unit consists of a main section and an auxiliary section each capable of driving at least four accessories. If only four drives are desired, the auxiliary section can be omitted.

Power from the engine is taken from a single outlet and transmitted to the gear box through a spring buffer coupling assembly which absorbs torsional vibration by means of universal joints. The shaft provides a shear section for protection against excessive loads. A self contained lubrication system is used and sufficient oil is carred for sixty hours operation for both sections of the gear box and all accessories. The gear box may be mounted on either side of the firewall.

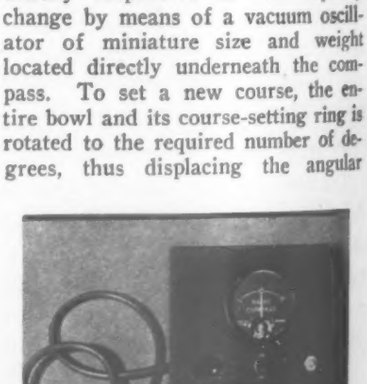
Gross weight of the unit is about 40 lb. dry excluding drive shaft, power take-off unit and cover plate. It is 21⅞ in. high, 14 in. wide, and 11 in. deep. — AVIATION, *May, 1937.*

Remote Reading Compass—

The West Telemagnetic Compass designed for aircraft use.

WORST PROBLEM OF COMPASS LOCATION ON AIRCRAFT is to place the instrument in a region of minimum deviation and, at the same time, keep it where it may be readily read by pilot or navigator. One solution is offered in the West Telemagnetic Compass by Kelvin & Wilfrid O. White Co. (90 State St., Boston, Mass.) The compass operates a "left" and "right" indicator on the instrument board (similar in appearance to the indicator of a radio compass) from an electrical capacity change within the compass itself.

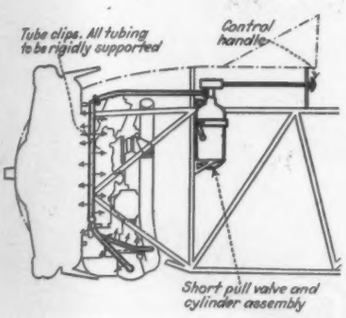
One extremely small condenser plate is secured to the compass needle and two others to the compass bowl, in such a way that as the ship swings in azimuth the small or movable plate passes closely by but always equidistant from the other two stationery plates. The steering indicator is made exactly responsive to this capacity change by means of a vacuum oscillator of miniature size and weight located directly underneath the compass. To set a new course, the entire bowl and its course-setting ring is rotated to the required number of degrees, thus displacing the angular



Telemagnetic compass

relation of the three condenser plates. As ship's head reaches the proper heading, the plates will again be in their normal relation, with the indicator hand then being on its zero or "on-course" position.

The Telemagnetic steering indicator is equipped with a sensitivity control whereby the pilot may make the hand slow or fast to suit his own preference or any weather condition. Moreover, as the indicator is unaffected by dip not exceeding 10 deg. from the horizontal, parallax error is entirely eliminated within that range.—AVIATION, *May, 1937.*

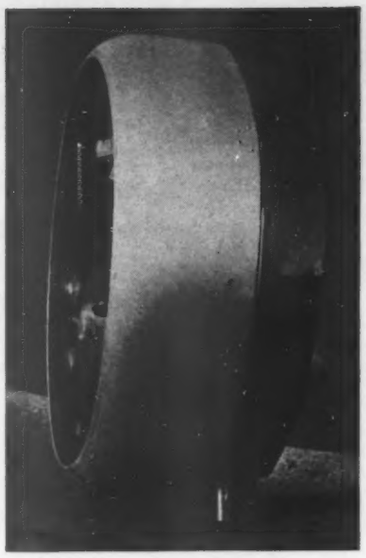


Lux single engine plane installation

Lux Fire Control—

New system, by Walter Kidde designed to smother engine compartment fires

BANISHING FEAR OF FIRE in the engine compartment of a plane in flight, the new manual or automatic LUX carbon dioxide engine fire control system has been so designed as to permit quick mounting on any type aircraft engine. This system, compact in design and weighing a total of approximately 18 lb. for a single engined installation (29 lb. for tri-motor—27 lb. twin-motor), discharges a fire-killing gas, stored in liquid form in lightweight cylinders, through a perforated duralumin ring surrounding the engine. The gas completely blankets the fire in three seconds. Control is normally placed on the instrument panel and storage cylinder may be mounted at any convenient point in the plane. Aviation Underwriters allow insurance reductions on Lux-equipped planes. Other special lightweight Lux fire extinguishing equipment is offered and a new twelve page illustrated color brochure entitled "White Magic Ends Fear of Fire" will be sent on request by Walter Kidde & Company, Inc., 140 Cedar Street, New York, N. Y.—AVIATION, *May, 1937.*



Engle streamline exhaust ring

Exhaust Ring—

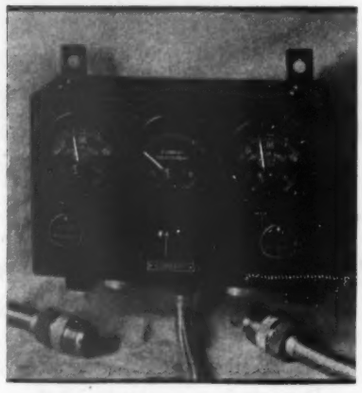
Especially applicable to use with N. A. C. A. cowling

A NEW TYPE STREAMLINED EXHAUST RING which eliminates all need for slip joints and flexible connections has been developed by Engel Aircraft Specialties of Escondido, Cal. The new ring is claimed to incorporate simplicity, quiet without use of muffler, suitability for attachment of air heater, ease of installation, and low price. It uses the engine diameter for inside dimension, employs a thin streamline section, for flexibility and excellent cooling.—AVIATION, *May, 1937.*

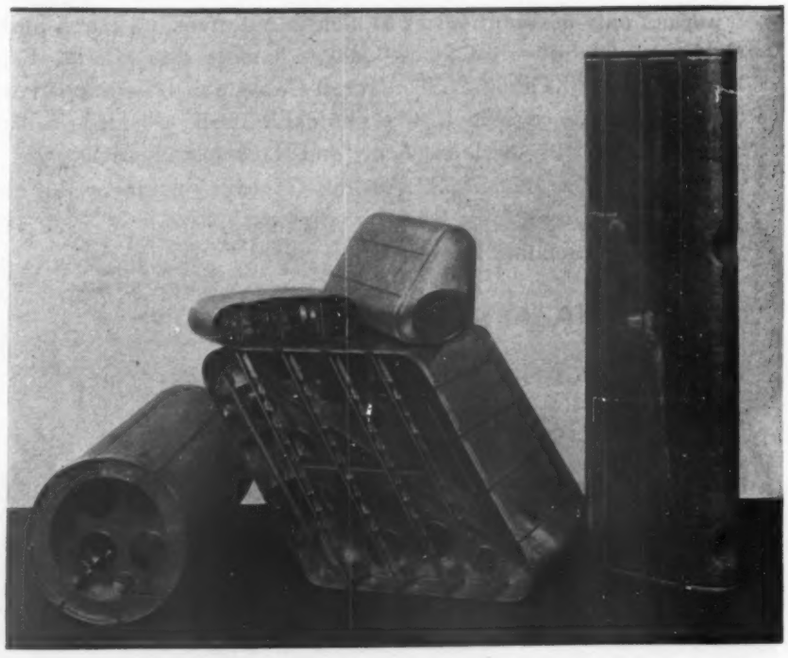
Two Breeze Products—

Exhaust gas analyzer and fuel and oil tanks shown at recent shows

IN ADDITION TO NUMEROUS PRODUCTS ALREADY ON THE MARKET, Breeze Corporations, Newark, New Jersey, has added two new items. These are the Breeze Exhaust Gas Analyzer, and a complete line of Breeze fuel and oil tanks. The Exhaust Gas Analyzer is featured by light weight, compactness for installation on either single or twin engine planes, and the ability to register quickly. The Breeze fuel and oil tanks are built on a new principal which entirely eliminates the use of riveted sections. Rolled joints are the chief characteristic of the Breeze method of tank construction.—AVIATION, *May, 1937.*



The exhaust gas analyzer (above)
Breeze fuel and oil tanks (below)



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Furthermore, "KORŌDLESS" is a preformed Cable. And preforming not only makes it easier to handle but gives it a much higher degree of fatigue resistance—makes it more dependable. Being preformed, "KORŌDLESS" Aircraft Cable can be equipped with Processed fittings, which, like this cable itself, are made in strict accordance with the latest Army and Navy specifications.

Insist on "KORŌDLESS" Aircraft Controls—made by the company that is in business for your safety.

Write for detailed information.

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ACCO

"KORŌDLESS" *Aircraft* CABLE

Operators' Corner

An exchange of ideas on the problems of the commercial aviation industry

QUESTION 20: Do you believe that a special license should be required for flying instructors? If so, what qualifications should be required? Should the number of hours needed be the same as that for the transport license or greater? Should some estimate of ability to impart knowledge be included in the requirements?

Need instructors rating

SOME PRIVATE PILOTS are capable instructors and some transport pilots never will be. At present there are a good many private pilots bootlegging instruction and being paid for it unofficially. There are also a good many transport pilots who have gotten their licenses by unfair means such as falsified log books and canned answers to examination questions.

The only effective solution for this problem is an instructor's rating,—a special classification of license given by the Air Commerce Bureau and based on the ability of a pilot to impart knowledge to students. Such a rating could be conferred on either private or transport pilots with the stipulation that private pilots with instructor's ratings not be permitted to charge for time.

Such a regulation could be adequately enforced only by personal contact with instructors throughout the country. Issuance of the ratings should be done progressively after personal examination of each instructor. All pilot-instructors now operating should be permitted to continue until the time of their examination and thereafter at the direction of the examiner. In addition to the field personnel, a small staff at Bureau headquarters could be maintained to collect and distribute background material and other information to assist pilots in qualifying for their ratings.

In the course of time this system would weed out the undesirables and eliminate much of the troublesome competition that has harassed responsible operators and, in many cases, made flying instruction hazardous to students.—A. G. NORWOOD, *Instructor in Aviation, Teaneck High School, Teaneck, N. J.*

QUESTION 21: Should a private pilot be allowed to carry and instruct students in licensed aircraft merely because he is not being paid? Have you had any experience with this problem? What is your solution?

How then do you interpret Paragraph E, Section 46, Bulletin 7, of the Air Commerce Bureau which states that a private pilot may not, for hire, instruct students?

(Submitted by H. E. Martin, Manager, Dennison Airport Operating Co., Atlantic, Mass.)

Leave Private Pilots Alone

THE BACKBONE OF THE AVIATION INDUSTRY is the licensed private pilot. It would seem a drawback if his privileges are in any way curtailed. He may not be able to instruct as well as some transport pilots but on the other hand he will be the means of getting other people in to the air and trained and ready to buy airplanes. Some people cannot pay for transport instruction and others do not want to pay for it. For instance the present-day father or brother will naturally want to train his son or kid brother or best friend, etc. Let them alone and cut out the red tape or we will have nothing but a few broke operators and subsidized air lines forever.—L. G. MASON, *Aviation Supply Division of the Montgomery School of Aeronautics, Montgomery, Ala.*

Ability the Criterion

AS WE HAVE INTERPRETED the Air Commerce Rules regarding private pilots instructing, we believe that private pilots can instruct where they use their own airplane and donate their time and services to whomever they are instructing. If a private pilot rents an airplane and wishes to give instruction to a friend who must, of course, hold a student permit we believe that this does not violate the regulations. Our experience has been that there are certain individuals who have ability as instructors and who have successfully taught several of their friends to fly.—A. ELLIOTT MERRILL, *Pres., Washington Aircraft & Transport Corporation, Boeing Field, Seattle, Wash.*

Helps Build Up Time

A PRIVATE PILOT most certainly should be permitted to carry and instruct students in licensed aircraft providing he does so without remuneration. Such a practice makes it possible for him to gain experience and at the same time to help his friends or relatives build up time. It also helps him to crystallize his own instruction by passing on the things he has learned to others.—THOMAS TURMEL, *Operations Manager, The American Escadrille, Floyd Bennett Field, New York, N. Y.*

QUESTION 22: To what extent does the family of a prospect for instruction or airplane purchase influence the sale? How do you sell the family? Do you invite his wife for a demonstration or do you evade the issue entirely? If you see fit to bring her into the negotiations, at what point in the selling process is it most effective? What ideas have you found most effective in "selling the lady?"

Even the Grandparents

IF WE ARE APPROACHING A NEW FAMILY for the first time on airplane sales work we treat each member with equal consideration even to the uncles, aunts and grandparents.

If a man approaches us himself we work on him and let him decide as to whether or not to bring his family out to the airport. If he does, we then work on them as well. We let the man guide us by his actions as to whether or not he is dependent on his family.—L. G. MASON, *Aviation Supply Division of the Montgomery School of Aeronautics, Montgomery, Ala.*

Next Month's Question

QUESTION 23: What solution have you found for smoothing out week-end and holiday peaks in the use of equipment? Do you maintain enough airplanes for slow day requirements and rent equipment from other operators when needed, or do you find it more profitable to have ships idle during the week?

News of the Month

Highlighting recent events in the aviation world

World Air Service Progresses

PAA completes New Zealand survey flight; prepares for China service. Start of Atlantic flying approaches

A LEISURELY SURVEY of 7,000 miles of Pacific Ocean was accomplished by Pan American Airways late in March and early in April. The Pan American Clipper, a specially outfitted Sikorsky S-42B, under command of Edwin C. Musick, made the circuit hop from San Francisco to Honolulu to Kingman Reef to Pago Pago to Auckland and back. Every variety of weather was found over the course, giving the crew full opportunity to experiment with blind flying and use of the radio direction finder. Of these there were two types: the large one at the grounds stations, and a smaller edition carried aboard the Clipper.

Because the flight was primarily a survey project, to observe and chart islands and weather peculiarities, the trip was considerably slower than will be the scheduled service. At that, outbound flying time, Honolulu to Auckland, was only 49 hrs. 27 min.; inbound, 32 hrs. 33 min. Captain Musick said on returning to Honolulu that the route was entirely feasible for a four or five day service from San Francisco to New Zealand.

The Pan American Clipper, renamed Hongkong Clipper, was scheduled to go into service between Manila and Macao and Hongkong April 21, closing the last gap in the trans-Pacific airway. That first flight was to be with mail only, and a week later, April 28, was the date set for the first through transport of passengers to the Orient. That will make possible a complete girdling of the globe by commercial airlines.

The Atlantic picture remains complicated and indefinite, with no date set as yet for even experimental flights, though preparations on British, American, and German fronts indicate early start of survey expeditions.

Early in April, news from Portugal told of the granting of landing rights in the Azores to Pan American. This includes radio, weather, customs, health, and immigration services. It is a result of three years of negotiations between Pan Am and the Portuguese government, and provides a 25 year franchise. It is understood that similar rights will be granted Britain's Imperial Airways.

The German company, Deutsche Lufthansa, while it has applied for rights in the Azores, is also taking steps in another direction. With a view to continuing the catapult-launching experiments of last Summer, a new mothership, Friesenland, was launched in March at Kiel. She will be stationed at Horta, in the Azores, whence flying boats will be launched. The Schwabenland, used in last Summer's trials on the Azores-New York-Newfoundland triangle, will be stationed some 2,500 miles nearer New York.

British plans center around the Empire Flying Boats, two of which, Caledonia and Cambria, have been engaged in long-range flight tests. They are aiming for Newfoundland, where the British are constructing a huge land and sea airport at Hattie's Camp, deep in the wilderness. There a mile-square field is being carved out of the forest. It will have three 4,500 ft. runways, each 600 ft. wide, and a master runway, parallel to the prevailing wind direction, a mile long and 1,200 ft. wide. On Gander's Lake, less than two miles away, a marine airbase is being laid out.

Final diplomatic tangles over location of terminals and other matters affecting joint operation by Pan American and Imperial Airways were

CLIPPER CLIPS TIME

between the United States and "down under." This Sikorsky S-42B, which April 21 was scheduled to go into regular service between Manila and Hong Kong, pioneered a new 7,000 mile trans-Pacific route to New Zealand.

cleared away early in April. Though British and Canadian representatives held out for Montreal as the terminal, as part of the British scheme of "all-empire" service, Col. J. Monroe Johnson, Assistant Secretary of Commerce, insisted that if it were to be a joint service, the Western terminal should be New York.

Meanwhile another element appeared in the picture: The Glen L. Martin Company, builder of the three Martin 130 Clippers now plying the Pacific for Pan American, announced plans for a new flying boat with a passenger capacity for 40, range of 5,000 mi., speed of 175 mph. on 53½ per cent power, payload other than passengers of 7,200 lbs. They would be used on an 18¾ to 21 hr. North Atlantic Service, operated by a company now being organized to compete with Pan American.

Details of the six 40-50 ton, 72 passenger flying boats being built for Pan American by Boeing at Seattle were announced April 19. They will have three decks, the top to house the flight bridge, crew living quarters, and a large cargo compartment. The main deck will carry the passengers, dining and lounge cabins, and galley. The lower deck will be the main cargo hold.

Most significant announcement concerning these boats is the fact that they will be powered with four engines newly developed by Wright: fourteen-cylinder, twin-row Cyclones developing 1,500 hp.—most powerful radial air-cooled engines yet developed. Twenty-six of them will go to Pan American for use in the new "super-Clippers."

Time Flies Fast—

Hawks demonstrates new ship, breaks Miami-Newark mark

FIRST PUBLIC DEMONSTRATION of Frank Hawks' Pratt & Whitney Twin Wasp-powered monoplane, Time Flies, was made at New York's North Beach Airport April 3, when Hawks set it down on the runway after a 300-mile-an-hour, 48 minute flight from Washington, where he had taken it to demonstrate the engine installation to interested Army and Navy officials. Use of the engine, rated at 1,150 hp. for takeoff, was sanctioned by both services, as it is on the restricted lists of each.

He promised near-future attacks on existing inter-city speed records—then April 13 (perhaps prophetic, as Time Flies' license number is NR1313) made good his promise by flying from Miami to Newark, 1,196 miles, in 4 hrs. 21½ min. Howard Hughes holds a 4 hr. 21½ min. record from Miami to Floyd Bennett Field.

But that was Time Flies' last flight, as the right wing spar broke during the rough landing. The ship came to rest upright and with its pilot unharmed, but its right wing hung dolefully. Hawks indicated that he would not rebuild it. "I've had my day."

"IF AT FIRST YOU DON'T SUCCEED . . ."

And Amelia Earhart is going to do just that, for she has announced that she will ". . . try, try again." She will push off again on her projected "round-the-equator" flight as soon as her Electra is repaired. A crash in Hawaii ended the first attempt.

Calendar

May 29-30-31—International Aerobatic Competition and Saint Louis Air Races, Lambert-St. Louis Airport.

June 26-July 10—Eighth Annual Soaring Meet (International), Elmira, N. Y.

July 23-Aug. 1—Fourth International Aviation Meeting, Zurich, Switzerland.

Sept. 3-6—National Air Races, Cleveland, Ohio.

Oct. 7-9—SAE National Aircraft Production Meeting.

Safety Wins—

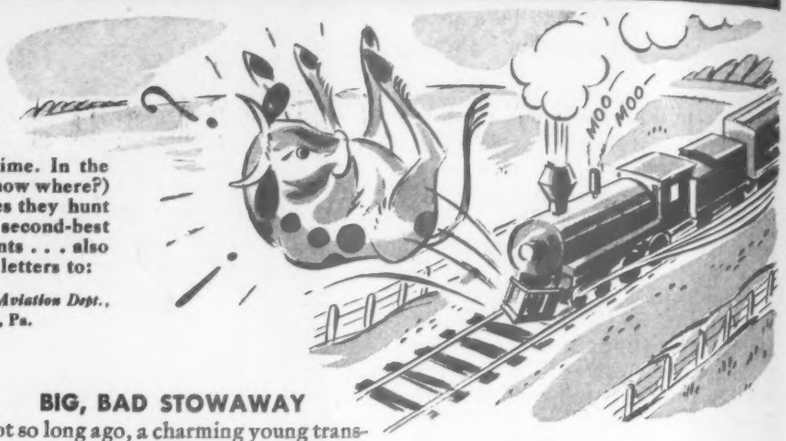
Eastern, Northwest, PCA honored for their operating records

SAFETY IN AIR TRANSPORT was concretely recognized April 14 by the National Safety Council at the eighth annual dinner of the Greater New York Safety Council. For outstanding contributions to safe air travel, three airlines—Eastern, Northwest, and Pennsylvania-Central — received awards for their operating records.

In Group A—domestic airlines operating more than 50,000,000 passenger miles annually, EAL was winner, with a record of 141,794,894 passenger miles without any passenger fatalities. This covered the years from 1930 to 1936. Group B winner—airlines operating less than 50,000,000 passenger miles annually—was Northwest, which never had a passenger fatality in its entire operating history, 1927-1936. The line flew 48,768,411 passenger miles.

A special award was made Pennsyl-

The Birdmen's Perch



Hunting by plane is getting to be a popular pastime. In the West they hunt coyotes . . . some place (do you know where?) they hunt seals . . . and over in the Malay states they hunt eagles and flying foxes by plane. We'd give our second-best goggles to get some first-hand stories of these hunts . . . also any other yarns you have on your chest. Ship all letters to:

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," *Mgr., Aviation Dept.*, Gulf Aviation Products, Gulf Building, Pittsburgh, Pa.

HOW DOES A FLY FLY?

A pilot I nominate for immortalization is "Spike" Callahan. "Spike" washes dishes for a living and, in his spare time, flies. He owns a two-cylinder Cycloplane.

"Spike" attends every meeting of the local pilots association. On occasion, at meetings, he has been known to take a swig from the bottle of white port he carries.

One evening during a lull in the meeting "Spike", who had been quietly gazing upward, spoke out. "Gents", he drawled, "does a fly half-roll or half-loop when he lands on the ceiling?"

At first, all "Spike" got was a laugh. Then the fellows became interested. By the great slipstream, which way did a fly land?

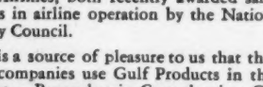
For weeks pilots chased flies. Arguments raged. Two guys darn near came to blows. Finally our president appointed a bug-committee to solve the question.

Their report, the final authoritative word on the subject, is this: A fly lands on the ceiling at the top of a loop. And to take off again he just falls away head-first in a dive which completes the loop.

Now, ain't that sumpin'?

—Cecil Meadows, Bakersfield, California

A FINE RECORD



Gulf extends its sincere congratulations to Eastern Air Lines and to Pennsylvania Central Airlines, both recently awarded safety prizes in airline operation by the National Safety Council.

It is a source of pleasure to us that these two companies use Gulf Products in their planes — Pennsylvania Central using Gulf Aviation Gas, and Eastern using Gulf Aviation Gas and Gulf Airline Oil exclusively.

BIG, BAD STOWAWAY

Not so long ago, a charming young transport pilot (female) got the scare of her life.

As she was all set to take off, a stowaway peered at her from beneath a seat. She screamed, then scrammed—forgetting, in her fright, to shut off the engine.

The ship crashed. The stowaway was killed. But nobody troubled to attend his funeral, for the poor thing was only a mouse.

—A. L. G., Nashville, Michigan

OF ALL THE NERVE!

A lady called the Meteorological Department at Mitchell Field, saying:

"Will you please give me the ceiling and visibility?"

"Where?"

"Just locally."

"Ceiling 1500 feet."

"What is the dew point?"

"Sixty-five."

"What is the temperature?"

"Seventy."

"Will you please give me the weather forecast for this afternoon?"

"Cloudy. Overcast. No change in temperature. By the way, lady, where are you going to fly?"

"Oh, I'm not going to fly. I just wanted to know whether to serve tea in the dining room or on the terrace."

—Rudolph Smutny

WHOPPER OUT-WHOPPERED

Remember that cow H. R. wrote about in the March "Perch"? The one that drank Gulf Aviation Gas—and gave off milk that was plain dynamite.

I want to warn the bozo (H. R., not the bossy). For we had a cow what did the same thing.

Her milk tasted awful. But being on a railroad construction job, I decided we might get some good out of the stuff. So we put some of it in the boiler of a little switch engine we had.

The switch engine ran swell. Oh, she was the best little switch engine you ever saw. But . . .

When the whistle cord was pulled the engine mooed. When the engine mooed an amorous bull jumped a fence nearby. When the bull met the switch engine he was knocked galley-west.

The bull's owner threatened to sue. We calmed the owner by giving him our cow in exchange, our wonderful cow that gave off high-test gas.

Now the farmer's madder than ever. He bred the cow. The calf was born with no tail but a complete empennage, including vertical fin and adjustable stabilizer. And just as he figured to make his fortune out of the darn calf, the little ingrate flew away and has never been heard of again.

—Charles L. Funnell, Yonkers, New York

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF **GULF AVIATION PRODUCTS**

vania-Central for having flown 36,177,210 passenger miles between 1930 and 1936 (its recorded period of operation) with neither passenger nor crew fatality.

Speaking of the "Big Four"—American, Eastern, TWA and United—the National Safety Council called their record "almost unbelievable," quoted figures showing that between 1930 and 1936 these lines increased the number of passenger miles flown 785 per cent, at the same time reducing the number of passengers killed per million passenger miles flown by 85 per cent.

An afternoon aviation session of the Council heard talks by Charles F. Horner, president of the NAA; S. Paul Johnston, editor of AVIATION; Shorty Schroeder, assistant director of the Bureau of Air Commerce; Charles H. Gale; D. W. Tomlinson, assistant to the vice-president of TWA, and C. S. (Casey) Jones.

Chimneys Topple —

Floyd Bennett and Boeing Fields lose old hazards

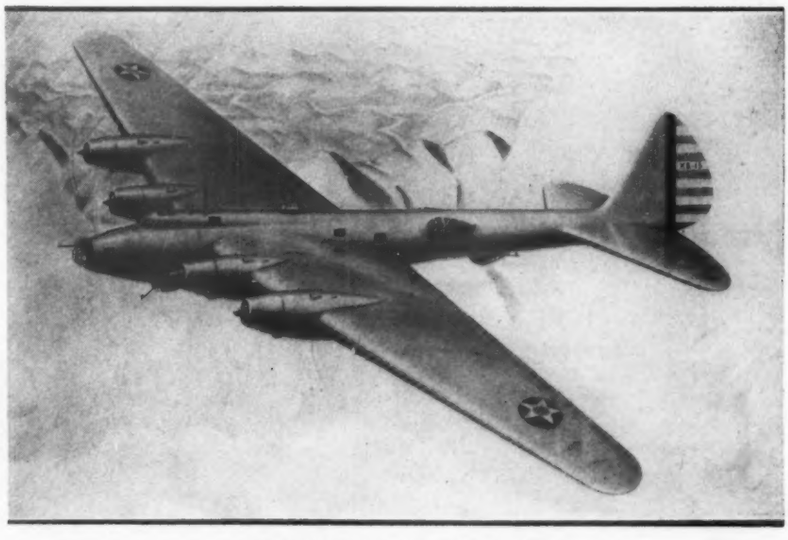
A LONG-FOUGHT OBSTACLE at New York's Floyd Bennett Field—a 227 ft. chimney—was blasted out of existence at a ceremony March 20. It was the last important hazard at New York's Municipal Airport No. 1. A $400,000 Coast Guard base will shortly be constructed at the field, providing a seaplane ramp into Jamaica Bay, hangars, and barracks.

A hazard in the form of two 300-ft. stacks on the north end of Boeing Field, Seattle, Wash., are being removed, and the 8,000-ft. runway on the field is rapidly being completed, according to reports from that area.

Eastern Air Lines, which penetrated west as far as Houston, Tex., when it bought Wedell-Williams Air Service last fall, will greatly benefit from a $500,000 bond issue recently passed by Houston. Proceeds of the issue will be used to acquire municipal title to the airport, and to make extensive improvements in the surface and in the erection of new buildings. $241,000 will be spent for purchase of the present 193 acres comprising the field, plus an additional 453 acres. The balance, $259,000, will be used to lengthen runways to a mile and provide for the erection of much-needed new buildings.

Bureau of Air Commerce engineers are installing an elaborate runway approach marker system at Lambert-St. Louis Airport. Set up on a direct East-West line, the system will provide, first, a conventional radio range beacon, then an outer runway localizer, an inner runway localizer, then a series of lights leading to and outlining the runway. The key to the system is a series of 15 neon tubes, spaced at intervals of 100 ft. from the rim of the field to a point at which the inner markers will be placed. They will be controlled by a photoelectric cell, which will turn them on at the first suggestion of haze. They are counted on to penetrate at least 100 ft. through fog by reflecting light from the particles of moisture.

The Connecticut Chamber of Commerce is lending its support to a bill introduced in the legislature to delegate to the State Aeronautics Commission power to buy or lease lands in the State for use as landing fields. These would be in the form of "landing strips" along existing State rights-of-way. Support for the bill was voted at a recent meeting in Hartford at which F. W. Orr, executive vice-president of the Connecticut Chamber, presided. Speakers favoring this measure included State aviation Commissioner C. L. Morris and former governor Trumbull.



TWENTY-TON BOMBER

by Boeing. A further development of the YB-17, it will be powered with four 1,000 hp. Pratt & Whitney Twin Wasps. Engines will be accessible in flight from the nacelles.

World Markets Grow—

The industry expands to the tune of rising export orders and better prospects at home

AMERICAN PLANES CONTINUE TO FIND WORLD ACCEPTANCE, as is indicated by an announcement from Bellanca Aircraft Corporation, to the effect that Air France, the French national air line, has purchased twenty planes at a cost of about $800,000. The ships are similar to the "Flash" which was used by Captain James A. Mollison on his flight across the Atlantic last summer. Air France will use them for transportation of mail. Six of the planes were completed by early April, and the remainder of the order is scheduled for shipment by June 1.

Bombers to Argentine—A contract for 35 bombers has been awarded the Glenn L. Martin Co. by the Argentine government. The order, which brings the company's unfilled order backlog to $12,500,000, will be filled this year.

Sales for Ryan—Sam Breder, Ryan sales manager, who recently returned from the East, reported that the Ryan plane received unusual attention at the New York Show. Twenty-one sales were made by Breder on his trip throughout the Eastern territory.

Taylor Comeback—Within a week after fire leveled its plant at Bradford, Pa., the Taylor Aircraft Co. delivered its first Cub, through the cooperation of the Bradford Chamber of Commerce and local manufacturing concerns.

Famous in Commerce ...
NOW CHOSEN BY ARMY AND NAVY!

Soon two fleets of new S-43's will soar away from the Sikorsky plant to enter the service of the U. S. Army and Navy. The selection of these famous amphibions for transport, convoy and general utility purposes is further evidence of Sikorsky's dependability in long range operations calling for speed and maximum useful load.

SIKORSKY AIRCRAFT

BRIDGEPORT, CONNECTICUT

DIVISION OF UNITED AIRCRAFT CORPORATION

Orders during the week following the fire were larger than in any single week since the company began manufacturing planes seven years ago—which meant that production had to be resumed promptly.

South American North Americans—North American Aviation, late in March, reported the sale of thirty two-seater military general purpose aircraft to Argentina for a price of approximately $800,000. Both North American and Northrop have announced that they are bidding on an additional Argentine order for approximately $1,000,000.

Seven Roadables—Waldo Waterman, president of the Waterman Arrowplane Company, reports sale of seven of the new roadable Arrowbiles, the first of which was introduced at the recent National Pacific Aircraft Show. Waterman credits the Show with sale of five of the seven planes; these five being on order for Studebaker.

Production Under Way—Security Aircraft Corporation, Long Beach, Cal., completed construction of jigs for aircraft production on April 15 and started construction of the first production lot of twenty-five of the new Security Airsters, folding wing cabin monoplanes seating two.

Pan American DC-3s—Among recent orders announced by Douglas Aircraft Company are seven twenty-one passenger model DC-3 planes for Pan American Airways at a figure said to involve an even $1,000,000. It is understood that the planes are to be placed in service on the Brownsville-Cristobal route, and along the west coast of South America.

Bendix—Pacific Airmotive Corp., leading Pacific Coast aeronautic service and supply house with headquarters at Burbank, Cal., and branches in several Western cities, has been purchased by Bendix and will be known in future as Bendix Aviation Corp., Ltd. Palmer Nichols continues as head.

Vultee Orders—Secret orders from foreign governments totalling more than $3,500,000 for high speed light bombing planes have been booked by the Vultee Division of the Aviation Manufacturing Corporation, Downey, Cal., according to Don P. Smith, vice-president and general manager.

Armada Amassed—

Air corps gathers 244 planes for war games on Pacific coast

EVIDENCE OF THE ARMY'S DETERMINATION to reach a close approximation of wartime mobilization problems in America's greatest military mass maneuvers of aircraft is indicated by the secrecy with which the GHQ Air Force, under command of General Frank M. Andrews, has prepared for the consolidation of 244 planes in California early in May.

Planes will base at March Field, Riverside, and operate for a period of more than a week in intensive military problems over the territory ranging from Albuquerque, New Mexico to the Pacific Ocean, and from Fresno, Central California to the border of Lower California, Mexico. Official start of the maneuvers is set for May 5 which is designated as "M" day, or mobilization day.

Business Booms—

Fixed base operators prosper again. New England groups organize

REPORTS FROM OVER THE COUNTRY show constantly increasing activity among the fixed-base operators in ship sales, charter business, sightseeing flights. Much of the new ship buying is the result of a constant growth in student enrollments.

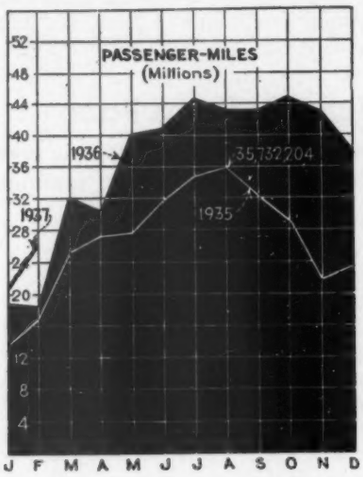
Dale Hunter, Porterfield distributor at Sacramento, Cal., has reported sale of one of the popular little ships to Dr. A. E. Lower of Sacramento. This made necessary a hasty trip to Kansas City to get another new plane, and at the same time Hunter arranged for delivery of one of the new Porterfield Zephyrs.

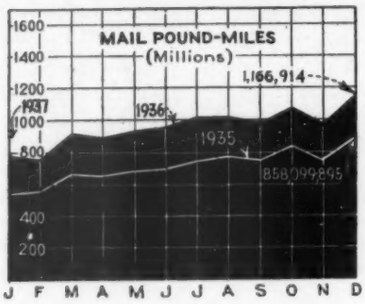
Three airplane sales were announced in Oklahoma City on March 27 by airport officials, making a total of eleven sales in Oklahoma City in the 90 days preceding that date. Hardy Young announced the sale of a new Waco standard cabin biplane to Harry Blackstock, Oklahoma City oil man. The new plane will be flown by Forrest Blackstock, his son.

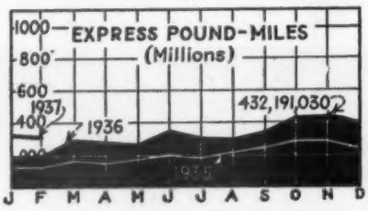
The Aircraft Operators' Association of New England was formed late in March by several New England fixed base groups. The nucleus of the association comes from Massachusetts and includes Shobe Airline, Boston Municipal Airport; Bayside Flying Service, Hingham; Dennison Airport Operating Co., Wollaston; East Coast Airways, West Hanover; Framingham Air Service, Framingham; E. W. Wiggins Airways, Norwood and Providence (R.I.); Inter City Airlines, Boston Municipal Airport; Oldden Flying Service, New Bedford; Fitchburg-Leominster Airways, and Mendon Airport. The purposes of the organization are twofold: first, to raise the standard of flying throughout New England by agreement on regulations

Traffic

Latest available statistics from the Bureau of Air Commerce and the Post Office Department—Domestic airlines only







AIR TRANSPORT INDICATOR

April 1, 1937

107

—which is the ratio of revenue passenger miles for March 1937 as compared with the corresponding figure for March 1936.

For February 1937 the indicator stood at 138.4.

and requirements at the many airports, small and large, that dot the New England countryside, and by close cooperation, as a group, with federal and State authorities. Second, to stabilize prices. A mail canvas of every New England airport is to be conducted to extend the membership to all fixed base operators.

Schools Keep Pace

Radio courses emphasized to meet more exacting industry demands

ONE OF THE MOST SIGNIFICANT recent trends in air school curricula is the addition of or greater emphasis on radio courses, which deal both with installation and maintenance of radio equipment and with navigation by use of radio. This is the result of the greater importance being placed on radio aids by the Bureau of Air Commerce, which will eventually require both shielded loop antennas and radio direction finders aboard scheduled air transport ships.

The Robertson Aviation School, a division of the Robertson Aircraft Corporation, Lambert Field, has announced addition of a nine month radio course. Joseph W. Wecker, manager of the school, has also announced the extension of the present six months airplane and engine mechanics course to be extended to a nine months course.

Official photograph, U. S. Navy

NEW POWER

for the Navy is promised by this experimental scout bomber by Brewster Aeronautical. It is Cyclone-powered. Performance figures are not revealed.

Spring enrollment at Joe Plosser's Grand Central Flying School, Glendale, Cal., is reported at a new high. A relatively high percentage of instruction is now in the blind flying and aerobatic classes.

Total tuition value of the Boeing School of Aeronautics 1937 W. E. Boeing Scholarships will be more than $11,000. The committee of award met at the Boeing School at Oakland, Cal., April 2 to select the winners. Invited to serve on this committee, which will make the eighth annual award, are Dr. Baldwin M. Woods, head of the Mechanical Engineering Department, University of California, as chairman; William B. Stout, of the Stout Engineering Laboratories; and Professor Frank Hockema of Purdue.

Following the term beginning March 29, Parks Air College, East St. Louis, Ill., is planning an increase in prices for their various courses, the increases ranging from $192 to $312, or a little more. Reason is that course prices are all-inclusive, taking care of room, board, and equipment as well as tuition, and the general commodity price level has gone up 5 per cent in the last few months.

Theodore Woolsey, president of the Aeronautical Institute of Los Angeles, has announced the appointment of Ray Jerome, formerly with the Hemphill Diesel Schools, as registrar.

Specializing in advanced flight training, instrument flying, radio navigation, and aerobatics, a new flying school has been established at Clover Field, Santa Monica, Cal. Known as Marion McKeen Aeronautics, the new school has the financial backing of Mrs. Edith Boydston "Dick" Clark, wealthy socialite woman pilot.

Walter Balch, chief of ground school instruction at the Ryan School of Aeronautics, San Diego, Cal., has announced the appointment of Vincent Hamilton as aircraft welding and assistant sheet metal instructor.

A new aviation course emphasizing airway navigation is being offered by The Stewart Technical Trade School, New York. The course is under the direction of Comm. P. V. H. Weems, originator of the Weems System of Navigation. It will deal primarily with the application of radio to airway navigation, and will also include dead

BOEING SCHOLARSHIP WINNER

Edward Sisul (right) is given the "inside dope" on a Hornet engine at the Boeing School of Aeronautics, Oakland, Cal. His instructor is Ernest Camy.

MARTIN B-10-B BOMBERS
SUPERIOR performance—greater reliability—and increased striking power characterize the improved Martin Bombers of today. Latest developments in facilities for offense and defense are embodied, and significant refinements in aerodynamic detail have been made. Identified as Model 139-W, these Martin B-10-B Bombers are available for early delivery.
THE GLENN L. MARTIN COMPANY, BALTIMORE, MD.
Builders of Dependable
Aircraft Since 1909
TRADE MARK

PIONEER
Sensitive Altimeter

While the primary function of the Sensitive Altimeter is to accurately indicate altitude, the facility for adjusting "zero" to any given pressure level is of equal importance ◆ In the Pioneer setting arrangement, only the desired barometric pressure reading is visible in large, distinct numerals which make possible a precise "zero" adjustment and assures accurate altitude indications ◆ Pioneer Sensitive Altimeters are available in various combinations of altitude scale and barometric setting to meet requirements throughout the world.

PIONEER INSTRUMENTS

PIONEER INSTRUMENT COMPANY INCORPORATED

BROOKLYN • NEW YORK • A SUBSIDIARY OF THE BENDIX AVIATION CORPORATION

reckoning procedure for off-the-airway flying.

Five Alaskan students have recently enrolled in the aviation school conducted at Seattle's Boeing Field by Washington Aircraft and Transport Corporation.

Lyon Air Services, San Bruno, Cal., has reported brisk business in passenger hopping and student instruction, with 26 new students enrolled during February and March. The company is dealer for the popular Ryan ST.

Vidal Airline?

Industry talk connects him with Collins, Earhart, Putnam

THE INDUSTRY JOB that was hinted at when Eugene Vidal left the Bureau of Air Commerce last February appeared in the offing by mid-April. Widely discussed was inauguration of a new airline on the Boston-New York-Washington run.

Said to be among the key executive personnel, in addition to Vidal, are Paul Collins, of Boston-Maine—Central Vermont Airways, Amelia Earhart, and her husband, George Palmer Putnam.

Hughes to Counsel—

Appointed aeronautical advisor to New York's 1939 World's Fair

HOWARD HUGHES, holder of both the world landplane speed record and the American transcontinental speed record, has been appointed Aeronautical Advisor to the World's Fair, to be held in New York in 1939. Said World's Fair President Grover Whalen: "In recognition of the great part which aviation will increasingly play in 'The World of Tomorrow'—which is the creative spirit of the World's Fair—we sought the aid of Mr. Hughes."

Air Corps Buys—

73 basic trainers added to North American contract in process

HARRY H. WOODRING, SECRETARY OF WAR, has announced that a contract for basic training planes let to North American Aviation last Oct. 26 has been increased by 73 planes and a complement of spare parts. The original contract called for 117 planes at a cost of $1,432,600; the addition to the contract will add $903,381.

Of the 73, 40 will be modified to take a more powerful engine (Pratt & Whitney Wasp, R-1340). The others will have minor modifications to fit them for the training of pilots in the Air Corps Organized Reserve.

Although no formal award has been announced, it is reported that North American Aviation Corp., Inglewood, Cal., was low bidder March 26 for contracts to supply basic combat planes to the Army Air Corps. Quoted prices, exclusive of engines and accessories, were reported by Wright Field, Dayton, Ohio, as: North American, $13,580 each in lots of 25, and $12,920 in lots of 150. Northrop Corp., Inglewood, Cal., $24,301 each in lots of 25, and $20,188 in lots of 150. Seversky Aircraft Corp., Farmingdale, L. I.; $27,800 each in lots of 25, and $19,300 in lots of 150.

Schroeder Quits—

Bureau's Assistant Director will handle operations for United

AFTER ONLY A MONTH AND A HALF as Assistant Director of the Bureau of Air Commerce, Major Rudolph W. ("Shorty") Schroeder has announced his resignation from the Bureau to accept a position with United Air Lines as vice-president in charge of operations. When he will assume his new post is still indefinite, as Assistant Secretary Johnson wants "to hold on to him for a while, if he and the air line are willing".

Schroeder will replace D. B. Colyer as United's operations manager. Colyer will become assistant to President W. A. Patterson. "It is going to be a hard job for me to replace Major Schroeder in the Bureau," lamented Col. Johnson. Thus far there has been no hint as to who his successor will be.

Double Trouble —

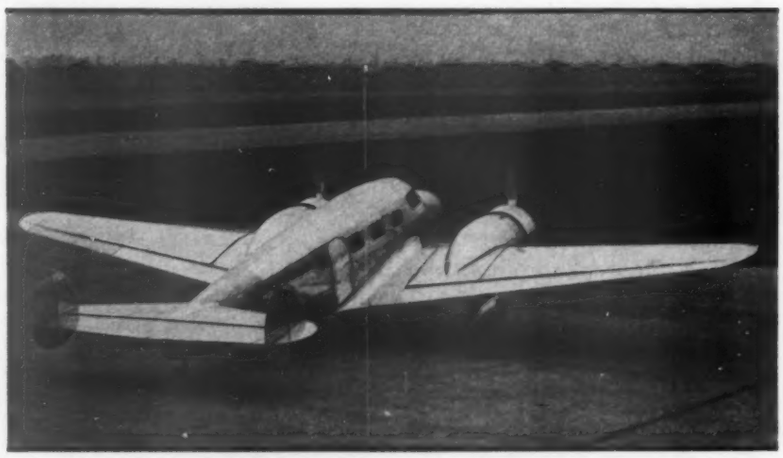
KLM delivery lost in Arizona. TWA crash at Pittsburgh

FOR FIFTEEN YEARS Douglas Aircraft Company has been making fly-away deliveries of military and commercial planes from the Santa Monica factory, sending more than 1,800 planes through without mishap. But on Saturday, April 3, pilot Glen Moser, ferrying a DC-3 model from Santa Monica to New York, where it was to be transshiped to Holland for KLM, ran into instrument flying weather over eastern Arizona less than three hours after leaving Los Angeles. Airline planes in the same area came through safely, but Moser's DC-3 carried no radio transmitting equipment and so could send no word of his plight. On Tuesday, April 4th, his wrecked plane was sighted from the air by Major A. D. Smith, TWA division superintendent. The eight persons on board had perished.

The crew of three and ten passengers were killed when, on March 25, a scheduled westbound TWA flight out of Newark ran through a severe icing condition and crashed on a hillside six miles from Pittsburgh.

The undoubted cause of the crash, according to Paul Richter, TWA's vice-president in charge of operations, was aerodynamic overbalance of the ailerons, caused by the ice which threw the ship out of control.

Douglas engineers have designed and tested a metal flap to close the gap over the ailerons and extensive test



BARKLEY-GROW TRANSPORT

now undergoing tests for license. Eight place and all metal, it is powered with two Pratt & Whitney Wasp Juniors. Many tentative orders are reported.

Roebling CONTROL CORD

WITH the development of larger ships traveling at greater speeds, the demands upon control cord become more and more severe. By building improved cords to meet the new requirements, Roebling has a hand in furthering the development of transport flying. Thus, you will find that the majority of plane manufacturers building planes for transport service use Roebling Aircraft Cord.

Roebling Wire Aircraft Products are made in Stainless Steel and High Carbon (Tinned or Galvanized) Steel. They include: *Aircraft Wire; Aircraft Strand; Aircraft Cord {6 x 7, 7 x 7, 7 x 19}; Ferrules and Thimbles; Serving and Locking Wires; Control Strand and Casing; Compressed Fittings for Attachments » Power and Lighting Cable » Welding Wire.*

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. *Branches in Principal Cities*

KEEPING PACE WITH AN INDUSTRY WHOSE WATCHWORD IS PROGRESS

flying over California mountains showed no tendency for ice to develop at this point, thus solving for all time, it is believed, any future danger from this source.

Explanation for the crash of a United Air Lines DC-3 into San Francisco Bay Feb. 9 was contained in the unanimous verdict of the airline's investigating committee: after finding no evidence of structural or mechanical failure, it was concluded that the cause was jamming of the controls by the co-pilot's microphone. It had fallen from its hook at his side into the well of the control column. This conclusion was borne out by a Bureau report dated April 12.

Circus Season —

Barkers and Aerobats brush up for busy Spring

BIRMINGHAM'S SEVENTH ANNUAL NATIONAL AIR CARNIVAL will be held Saturday and Sunday, June 5 and 6, this year. Steadham Acker, airport manager, has been selected by the Birmingham Aero Club to act as general chairman.

Names of 61 prominent St. Louis, Mo., men and business organizations, underwriters of a $50,000 guarantee fund for the International Aerobatic Competition and St. Louis Air Races to be held at the St. Louis Municipal Airport, has been announced by the St. Louis Air Race Association, sponsors of the meet. The competition, to be held over the Decoration Day weekend, is said by the National Aeronautic Association, which has sanctioned the event, to be America's first international aerobatic competition. Contestants will compete for $15,500 in prizes. Participation is by invitation and the entry list is limited to eight. Speed races in categories ranging from 397 to 550 cu. in. displacements, will offer prizes of from $2,000 to $2,500, and trials will also be held for world speed record for second category light plane and for a permanent national speed record trial. The meet will be under the direction of James Rowan Ewing.

Airlines Prepare—

Summer traffic demands more equipment, more schedules, more routes

THE DOMINANT THEME OF ACTIVITY among the airlines during the month was preparation for greatly increased passenger loads in the summer months to come. Several lines are adding equipment, others extending routes or adding schedules.

After a successful winter of operating at special lowered winter fares, TWA will inaugurate on May 1 a new fare structure for the summer months. The winter fares went into effect last Nov. 1, with a reduction of .8 cents from last summer's base of 6.1 cents per mile. The new summer fares this year will be figured on the basis of 5.7 cents per mile, higher than the winter rates, but lower than last summer's. In addition extra charge will be made for a berth or for a divan lounge chair. Berth charges will range from $3 to $8 depending upon the distance.

Although they did not reduce fares last Fall to meet TWA's, both American Airlines and United Air Lines will now come down to TWA's summer fare level.

More Speed for United—May 10, United Air Lines will establish two daily round-trip transcontinental runs. Equipment will be the Douglas Skylounge Mainliners. Only three stops will be made: at Chicago, Cheyenne and Salt Lake City. A third schedule, to start by June 1, will stop at Omaha instead of Cheyenne. Scheduled time will be 15 1/3 hours.

PCA Extension—Service to Charleston, W. Va., was inaugurated April 1 by Pennsylvania-Central Air Lines. The 192-mile flight between Pittsburgh and Charleston is scheduled for 90 minutes, with stops at Parkersburg.

Equipment Exchange—A passenger capacity increase of 140 per cent has been effected on Braniff Airways, which has purchased five of the 14-passenger Douglas DC-2s from Transcontinental and Western Air.

More Northwest Lockheeds—Announced April 9 was the purchase by Northwest Air Lines of eight of the new 14-passenger Lockheed 14s, powered with two Pratt & Whitney Hornet engines of 850 hp. each. Cost will be $560,000.

Profits Rise—

Thirteen 1936 reports show earnings. Two airlines report black ink

HEALTHY RECOVERY and growing markets are indicated by the substantial increase in reports of yearly profits for the industry. In many cases these profits are opposed to losses the year before. Following is the record of recent annual and quarterly reports:

AVIATION CORP.—Net profit of $104,015 for the quarter ended last Nov. 30. Net sales amounted to $3,511,303.

PERFECT CIRCLE COMPANY.—Earned $557,842, or $3.43 a capital share, in 1936, compared with $239,655, or $1.47 a share, in 1935.

WARNER AIRCRAFT CORP.—1936 profit, $644, after a $15,953 loss in 1935. 1936 sales totaled $269,683.

BOEING AIRPLANE CO.—Report showed unfilled orders totalling $8,921,797 on Dec. 31, 1936, and orders received during January and February of 1937 amounting to an additional $2,655,148. The 1936 profit was $168,364, compared with a loss of $333,800 in 1935.

WRIGHT AERONAUTICAL CORP.—A net 1936 profit, after surtax, of $1,057,098. Profit in 1935 amounted to $423,295.

WESTERN AIR EXPRESS, INC.—Net profits of $50,697 for the fiscal year ended December 31, last. This showing compares with a net loss of $8,188 for 1935.

CONSOLIDATED AIRCRAFT CORP.—Net income for the year ended Dec. 31, 1936, $192,411 after surtax, equal to .29 cents a common share; against $322,731 in 1935, or 56 cents a common share.

LOCKHEED AIRCRAFT—Sales for the first quarter of 1937 about $1,000,000, or approximately 50 per cent of total sales for the full year 1936. Unfilled orders were reported in excess of $2,500,000 and at one time during March reached $3,000,000, a new all time high.

SOLAR AIRCRAFT—Net profits for the quarter ending Feb. 28, 1937, $10,523.76. Sales for the quarter were $136,644.50, a new all time high.

AMERICAN AIRLINES—For 1936, a profit of $4,589, compared with a net loss of $748,370 in 1935. Passenger revenues were up more than 50 per cent.

BENDIX AVIATION—1936 net income of $3,025,490, against $3,163,921 earned in 1935.

GLENN L. MARTIN CO.—Net profit of $732,652 in 1936. This is equal to 87 cents a share on each of 842,083 shares of $1 par capital stock. The year's net sales totaled $6,219,774, including $1,734,340 of foreign deliveries.

CURTISS-WRIGHT CORP.—Profit of $1,017,657, equal to 88 cents a share on 1,158,351 shares of $1 par class A stock outstanding.

THE SPERRY CORPORATION—Net income for 1936 of $2,570,568, including a profit of $1,058,522 on sales of securities.

EX-CELL-O AIRCRAFT & TOOL CORP.—Net profit for 1936, $413,214.

THOMPSON PRODUCTS, INC.—Net profits, after surtax on undistributed earnings, $785,256 for 1936.

AVIATION'S Monthly Table

of Domestic and Export Commercial Airplane Deliveries for Month Ending April 10, 1937. (Items preceded by an asterisk (*) were reported for the period Jan. 1-March 10)

Purchaser and Number of Units	Type of Buyer*	Manufacturer	Model	Engine Make and Model
African Flying Service E (2)	School	Rearwin	8500	LeBlond 5F
*Air Activities, Inc	Fixed Base	Taylorcraft	A	Cont. A-40-4
Aircraft Sales & Service	Fixed Base	Taylorcraft	A	Cont. A-40-4
*Airplane Prod. Corp	Fixed Base	Ryan	S-T-A	Menasco C4
Airflite, Ltd. E	Fixed Base	Ryan	S-T-A	Menasco C4
Alford Flying Service	Fixed Base	Taylor	Cub J2	Cont. A-40-4
All-Metal Products Corp.	Corporate	Howard	DGA-8	Wright R760-E2
Amer. Eastern Aviation E	Govt	Stinson	SR-9D	Wright R760-E1
Amer. Eastern Aviation E	Govt	Stinson	A	Lycoming R680-B5
Atwater, W. C	Private	Fairchild	H DeLuxe	Ranger
Aviation Services, Inc	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Ball, John N	Private	Rearwin	9000-L	LeBlond 5 F
Barkoff, Wm. G	Commercial	Porterfield	CP-40	Cont. A-40
Bata Shoe Company E	Corporate	Lockheed	Electra	P&W Wasp Jr.
Bath, Stanley W	Private	Stinson	SR-9-DD	Wright R760-E2
Bendix Radio Corp	Corporate	Stinson	SR-9-DD	Wright R760-E2
Berry, A. W	Private	Rearwin	9000	Warner 90
Bingham, Jr., H. P	Private	Waco	YKS-7	Jacobs L-4
Bismarck Flying School	Fixed Base	Taylorcraft	A	Cont. A-40-4
Blevins Aircraft Corp	Fixed Base	Taylor	Cub J2	Cont. A-40-5
Blevins Aircraft Corp	Fixed Base	Taylor	Cub J2	Cont. A-40-5
Bowen, R. L	Private	Stinson	SR-9-DD	Wright R760-E1
Bowman Air Service	Fixed Base	Taylorcraft	A	Cont. A-40-4
*Braman-Johnson Fly. Ser	Fixed Base	Ryan	S-T-A	Menasco C4
Brandenburg, W. F	Private	Fairchild	C-8-E	Warner
Brayton Flying Service	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Brayton Flying Service	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Brian Allen Avia., Ltd. E	Fixed Base	Stinson	SR-9B	Lycoming R-680-B6
Brian Allen Avia., Ltd. E	Private	Stinson	SR-9D	Wright R760-E1
*Brian Allen Avia., Ltd. E	Private	Lockheed	12A	P&W Wasp Jrs.
*British Airways, Ltd. E (4)	Air Line	Lockheed	Electra 10A	P&W Wasp Jrs.
Brockenbrough, E. H	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Brown, James C.	Private	Monocoupe	90A	Lambert R266
*Brown, Ted	Fixed Base	Ryan	STA Special	Menasco C4S
Buchner, G. L	Commercial	Porterfield	35-70	LeBlond 5-E
Bullock, Harrison	Private	Fairchild	H Deluxe	Ranger
Burnham-Miller Fly. Ser.	Fixed Base	Taylor	Cub J2	Cont. A-40-4
*Byrd-Frost, Inc	Corporate	Lockheed	12A	P&W Wasp Jrs.
2847 Clark Bros	Private	Fairchild	C-8-E	Warner Super Scarab
California Flyers, Inc	Fixed Base	Taylorcraft	A	Cont. A-40-4
Carberry, Mal	Private	Cessna	C37	Warner Super Scarab
*Carpenter, R. R. M	Private	Lockheed	Electra 10A	P&W Wasp Jr.
Central Aircraft Sales	Fixed Base	Ryan	S-T-A	Menasco C4
Chambers & Wintheiser	Fixed Base	Taylor	Cub J2	Cont. A-40-4
*Clever, Harry	Fixed Base	Taylorcraft	A	Cont. A-40-4
Colin, Al	Private	Stinson	SR-8B	Lycoming R-680-B6
Cowden, R. B	Private	Rearwin	9000	Warner 90
*Crosley, Jr., Powell	Private	Lockheed	12A	P&W Wasp Jrs.
*Culver, Knight K	Private	Monocoupe	90A Deluxe	Lambert R266
Currey, Arthur	Commercial	Porterfield	CP-40	Cont. A-40
Dana, Peter	Private	Cessna	C37	Warner Super Scarab
Davis, V. G	Commercial	Porterfield	CP-40	Cont. A-40
Davison, Lawrence	Private	Taylor	Cub J2	Cont. A-40-4
*Delta Air Corp	Air Line	Lockheed	Electra 10B	Wright R975E3
*Demorr Aero. Corp	Fixed Base	Ryan	S-T-A	Menasco C4
DePointi Aviation, Inc	Commercial	Porterfield	CF-40	Cont. A-40
Dethloff, Lester	Private	Taylor	Cub J2	Cont. A-40-4
Eastern Airlines, Inc	Corporate	Stinson	SR-9-DD	Wright R760-E1
Eldorado Fly. Service	Private	Taylor	Cub J2	Cont. A-40-5
Emigh, Harold E	School	Rearwin	9000-L	LeBlond 5 F
Examiner Printing Co	Corporate	Stinson	SR-9-ED	Wright R760-E2
Fokker Nederlandsche E	Fixed Base	North Amer.	NA-16-2	P&W-S3H1
*Fox Valley Flying Serv	Fixed Base	Taylorcraft	A	Cont. A-40-4
Frewin, K. M. and S. S. Terry E	Private	Rearwin	8500	LeBlond 5 F
Gilmore, William Guy	Private	Taylor	Cub J2	Cont. A-40-5
Grande, Hasel	Private	Taylor	Cub J2	Cont. A-40-4
Greer, Dr. Joseph M	Private	Waco	YKS-7	Jacobs L-4
Groves, E. E	Private	Waco	YKS-7	Jacobs L-4
Guido Hauer E	Private	Rearwin	9000-L	LeBlond 5 F
Gulf Refining Corp	Corporate	Stinson	SR-9-BD	Lycoming R680-B6
*Haller Aviation Ltd. E	Fixed Base	Ryan	S-T-A	Menasco C4
Haller Aviation Ltd. E (2)	Fixed Base	Ryan	S-T-A	Menasco C4
*Erle P. Halliburton, Inc	Corporate	Lockheed	12A	P&W Wasp Jrs.
Hamilton, J. L	Private	Cessna	C37	Warner Super Scarab
*Hood, Donald	Fixed Base	Taylorcraft	A	Cont. A-40-4
Horison Flying Club	Private	Taylor	Cub J2	Cont. A-40-4
Horning, John C	Private	Stinson	SR-9-DD	Wright R760-E1
*Hubert & Dillon Air Serv.	Fixed Base	Taylorcraft	A	Cont. A-40-4
Hudson Valley Aircraft	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Hunter, Dale	Commercial	Porterfield	V-35	Velie M-5
Hunnicutt, R. H	Private	Rearwin	9000-L	LeBlond 5 F
*Humble Oil Co	Corporate	Lockheed	12A	P&W Wasp Jrs.
Humphrys, R. C	Private	Waco	YKS-7	Jacobs L-4
Industria Aero. Romania (Roumania) (3)	Air Line	Lockheed	Electra 10A	P&W Wasp Jr.
Imperial Oil, Ltd	Export Corp.	Stinson	SR-9D	Wright R760-E1
Jackson Fly. Service	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Jersey Air Service	Fixed Base	Taylorcraft	A	Cont. A-40-4
*Jersey Air Service	Fixed Base	Taylorcraft	A	Cont. A-40-4
Johnson, A. C	Fixed Base	Taylor	Cub J2	Cont. A-40-4
*Jones & Humeston, Inc	Fixed Base	Taylorcraft	A	Cont. A-40-4
*Kahn, Roger Wolfe	Private	Lockheed	Electra 10A	P&W Wasp Jr.
Kashower, R. K. (2)	Commercial	Porterfield	CP-40	Cont. A-40
Keyes, Frederick L	Commercial	Porterfield	35-70	LeBlond 5-E
Keyes, Frederick L	Commercial	Porterfield	CP-40	Cont. A-40
Kohlberg, Alfred	Private	Stinson	SR-9-BD	Lycoming R680-B6
Lamson, Wm. David	Private	Waco	YKS-7	Jacobs L-4
Lange, Anthony C	Private	Taylor	Cub J2	Cont. A-40-5
Larson, Frederick	Fixed Base	Stinson	SR-8B	Lycoming R680-B6
Las Vegas Gas and Oil Co.	Corporate	Lockheed	12	P&W Wasp Jr.
*Leger, Jack	Private	Monocoupe	90A Deluxe	Lambert R266
Livingston Airways Corp	Fixed Base	Taylorcraft	A	Cont. A-40-4
Louisville Fly. Serv	Fixed Base	Taylor	Cub J2	Cont. A-40-5
Louisville Fly. Serv	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Lupton, Roberts	Private	Ryan	S-T-A	Menasco C4
McMann, Harris S	Fixed Base	Taylor	Cub J2	Cont. A-40-5
McEnnan, Ed	Fixed Base	Taylor	Cub J2	Cont. A-40-4
McNemar, Raymond	Private	Taylor	Cub J2	Cont. A-40-4
Mackey, Donald	Private	Stinson	SR-9-BD	Lycoming R680-B6
Manolo Wiechers	Private	Fairchild	C-8-E	Warner Super Scarab
Meinke-Eldred Fly. Ser.	Fixed Base	Cessna	C37	Warner Super Scarab
Midwest Airways, Inc	School	Rearwin	7000	LeBlond 5E
Montgomery School	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Moore, Inc., E. H	Corporate	Howard	DGA-8	Wright R760-E2
Mostoller, C. R	Private	Fairchild		Warner
Canadian Dept. National Defence E (2)	Govt	Waco	ZQC-6	Jacobs L-6
Nietech, Dr. Lothar	Private	Taylor	Cub J2	Cont. A-40-5
O'Connor, Chas	Fixed Base	Taylor	Cub J2	Cont. A-40-5
Pacific Aircraft Sales	Private	Fairchild	H. Deluxe	Ranger
Pacific Aircraft	Private	Fairchild	G Standard	Warner Super Scarab
Patterson Airways, Inc	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Peters, C. N., & Shobe, H. R.	Commercial	Porterfield	35-70	LeBlond 5-E
Poesnecker, Ralph E	Commercial	Porterfield	35-70	LeBlond 5-E
Polish Air Lines E (3)	Air Line	Lockheed	Electra 10A	P&W Wasp Jr.
*Polish Air Lines E	Air Line	Lockheed	Electra 10A	P&W Wasp Jr.
*Pringle, Philo B	Private	Monocoupe	90A Deluxe	Lambert R266
Racine Flying Service	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Renkert, Harry	Fixed Base	Taylorcraft	A	Cont. A-40-4
William G. Ringel Fly. Ser.	Commercial	Porterfield	CP-40	Cont. A-40
Robbins, Reg	Corporate	Howard	DGA-8	Wright R760-E2
Robinson Air Service	Fixed Base	Stinson	SR-9B	Lycoming R680-B6
Rochester Aeronautical Corp.	Fixed Base	Taylorcraft	A	Cont. A-40-4
*Franklin Rose Aircraft	Fixed Base	Ryan	S-T-A	Menasco C4
Roulstone, John	Private	Ryan	S-T-A	Menasco C4
*Sanford Airways, Inc	Private	Lockheed	Electra 10A	P&W Wasp Jr.
Schrader, Leonard J	Private	Rearwin	9000-L	LeBlond 5 F
Seabra, Antonio L. E	Private	Rearwin	8500	LeBlond 5 F
Sell, I. Walter	Private	Rearwin	8500	LeBlond 5 F
Sioux Skyways	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Skylines Express of Can. E (2)	Air Line	Waco	ZQC-6	Jacobs L-6
Southern Airways, Inc	Fixed Base	Taylorcraft	A	Cont. A-40-4
Smith, Edgar F	Commercial	Porterfield	35-70	LeBlond 5-E
Smith, James V	Private	Taylor	Cub J2	Cont. A-40-4
*Standard Flying Ser	Fixed Base	Taylorcraft	A	Cont. A-40-4
*Stout Aviation Co	Fixed Base	Taylorcraft	A	Cont. A-40-4
Stower, Mrs. Margaret B.	Private	Waco	YKS-7	Jacobs L-4
Territories Exploration Co. E	Corporate	Stinson	SR-9-DM	Wright R760-E1
Texas Company	Corporate	Stinson	SR-9-ED	Wright R760-E2
Texas Company	Corporate	Stinson	SR-9-FD	P&W Wasp Jr.
*Tipton, W. D	Fixed Base	Taylorcraft	A	Cont. A-40-4
Tomair, Thompson	Air Line	Cessna	C37	Warner Super Scarab
Townsend, Jr., Harlee	Private	Fairchild	C8E	Warner Super Scarab
Transportes-Aeras de Jalisco E (2)	Airline	Spartan	7W	SB 450
U. S. Coast Guard (3)	Govt	Waco	EQC-6	Wright R760E-2
Va. Sportsman Pilots	Private	Taylor	Cub J2	Cont. A-40-5
Vaughan, Ray B	Fixed Base	Taylor	Cub J2	Cont. A-40-4
*Venesuela E (2)	Gov. Air Line	Lockheed	Electra 10A	P&W Wasp Jr.
Waco Sales of N. Y. Inc.	Fixed Base	Waco	ZGC-7	Jacobs L-6
*Walgreen Drug	Corporate	Lockheed	12A	P&W Wasp Jrs.
*Warwick, Howard	Private	Monocoupe	90A Deluxe	Lambert R266
Wheeler, H. Leibee	Private	Waco	YKS-7	Jacobs L-4
Whipp, Robt. E	Fixed Base	Taylor	Cub J2	Cont. A-40-5
White Fly. Service	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Whitney, Inc., O. J. (2)	Fixed Base	Ryan	S-T-A	Menasco C4
Wideroe Flyveselskap, E.	Fixed Base	Waco	YKS-7	Jacobs L-4
Wiggins, Inc., E. W	Fixed Base	Waco	YKS-7	Jacobs L-4
Wiggins Airways, E. W	Fixed Base	Taylor	Cub J2	Cont. A-40-5
Wings, Inc	Commercial	Porterfield	CP-40	Cont. A-40
Woodhams, Irving T	Private	Cessna	C37	Warner Super Scarab
Wright, Kenneth	Private	Stinson	SR-8B	Lycoming R680-B6

* *Private (sport), fixed base, corporate, air line, government (municipal, state and federal other than military).* "E" *indicates Export.*

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Every blade of a Hamilton Standard propeller is carefully checked for balance against a master weight before it goes to the assembly line. Each blade must be in perfect balance, not only for every position of rotation, but also throughout its entire range of pitch angles. The precision with which this equilibrium is achieved assures interchangeability of blades in the field and dynamic balance in operation.

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DIVISION OF UNITED AIRCRAFT CORPORATION

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Aviation People

Who's who and what they are doing

THEODORE P. WRIGHT

DONALD L. BROWN

MAJOR A. B. McMULLEN

JEAN BRUN

» Taking vice-presidencies in his stride, THEODORE P. WRIGHT has acquired two within the past month, — of Curtiss-Wright Corporation, and of the Institute of the Aeronautical Sciences, the latter a re-election. Mr. Wright has been affiliated with Curtiss-Wright and its predecessor subsidiaries since 1920, having had charge of airplane engineering activities at Curtiss Aeroplane & Motor Company in Garden City and later at Buffalo. Now located at New York headquarters as Director of Engineering of the Curtiss-Wright group, he is engaged in coordinating engineering activities. Since his promotion to that post from vice-president and general manager of the Buffalo Division in 1934, he has travelled in Europe and the Americas to assure a wide perspective for his company in engineering matters. Mr. Wright is a founder member of the Institute and represented it at the recent meeting of the American Association for the Advancement of Science, where he presented a paper on "Speed—And Airplane Possibilities."

» COL. J. MONROE JOHNSON, Assistant Secretary of Commerce, has appointed MAJOR A. B. MCMULLEN of Tallahassee, Florida, to succeed JOHN S. WYNNE as Chief of the Airport, Marking, and Mapping Section of the Bureau of Air Commerce. (AVIATION, March, p.99). Major McMullen is familiar with this phase of the Bureau's program through his work as assistant director of the Division of Airways and Airports of the Works Progress Administration. Previously he had been active in developing airports and landing fields in Florida where he served as Director of Aviation until 1933, then Director of the Aviation Division, Florida Works Progress Administration, and Director of Aviation Division, Florida Emergency Relief Administration. During the war he served as an instructor and engineer officer at several Army fields in this country.

» The re-elected board of directors of United Aircraft Corporation in turn re-elected the following officers: President, DONALD L. BROWN; senior vice-president, EUGENE E. WILSON; vice-president and chief engineer, GEORGE J. MEAD; vice-presidents, CHARLES W. DEEDS, GEORGE S. WHEAT, RAYCROFT WALSH, RENNSELAER W. CLARK, BERNARD L. WHELAN; controller and secretary, JOSEPH F. MCCARTHY; treasurer, CARROLL L. GAULT; accountant, FREDERICK E. BURNHAM.

» Names well known in commercial aviation appeared on the seating list of the luncheon arranged by the French Line to introduce MR. JEAN BRUN, newly appointed Air Division Manager of Air France-French Line. Mr. Brun, war ace and former executive of the Farman Company, has been active in the formation of the present organization of the various lines operated by Air France. Mr. HENRI MORIN DE LINCLAYS, resident general manager of the French Line, stated that Air France and the French Line are making surveys preparatory to the next experimental flights which they hope will take place in the course of a year.

» The ranks of aviation pioneers have been thinned through the death, on March 25, of WILLIAM H. MARTIN, aged 82. In 1909 Mr. Martin obtained the first U. S. patent on the monoplane type of airplane, the principles of which were applied to perfecting the present-day monoplane. The Martin craft was a glider, originally towed by horse, later by automobile. The model now hangs in the Smithsonian Museum.

» Air Express Division of Northwest Airlines, Inc., will be managed by FRED R. ERICKSON out of St. Paul. For the past sixteen years Mr. Erickson has been with Railway Express Agency, four of them in the Air Division.

» At the annual organization meeting of the Board of Directors of Roosevelt Field, Inc., the following officers were elected: JOHN W. HANES, chairman of the board; GROVER LOENING, chairman of the executive committee; W. D. GUTHRIE, president and treasurer; A. C. KENNEDY, vice-president and secretary; W. P. STUCHEL, assistant treasurer.

» First presentation of the Rear Admiral William A. Moffett Memorial Trophy was made to Lieut. Robert F. Hickey, as commanding officer of the U. S. S. *California* Aviation Unit of Observation Squadron Four. The trophy, in memory of the late Rear Admiral William A. Moffett, former Chief of the Bureau of Aeronautics, is awarded annually to the battleship- or cruiser-based aviation unit which flies the greatest number of hours during the year with proportionately minimum injury to personnel and equipment.

» Men of affairs will foregather at San Francisco on May 7 to do honor to DR. WILLIAM F. DURAND, emeritus professor at Stanford University, for his

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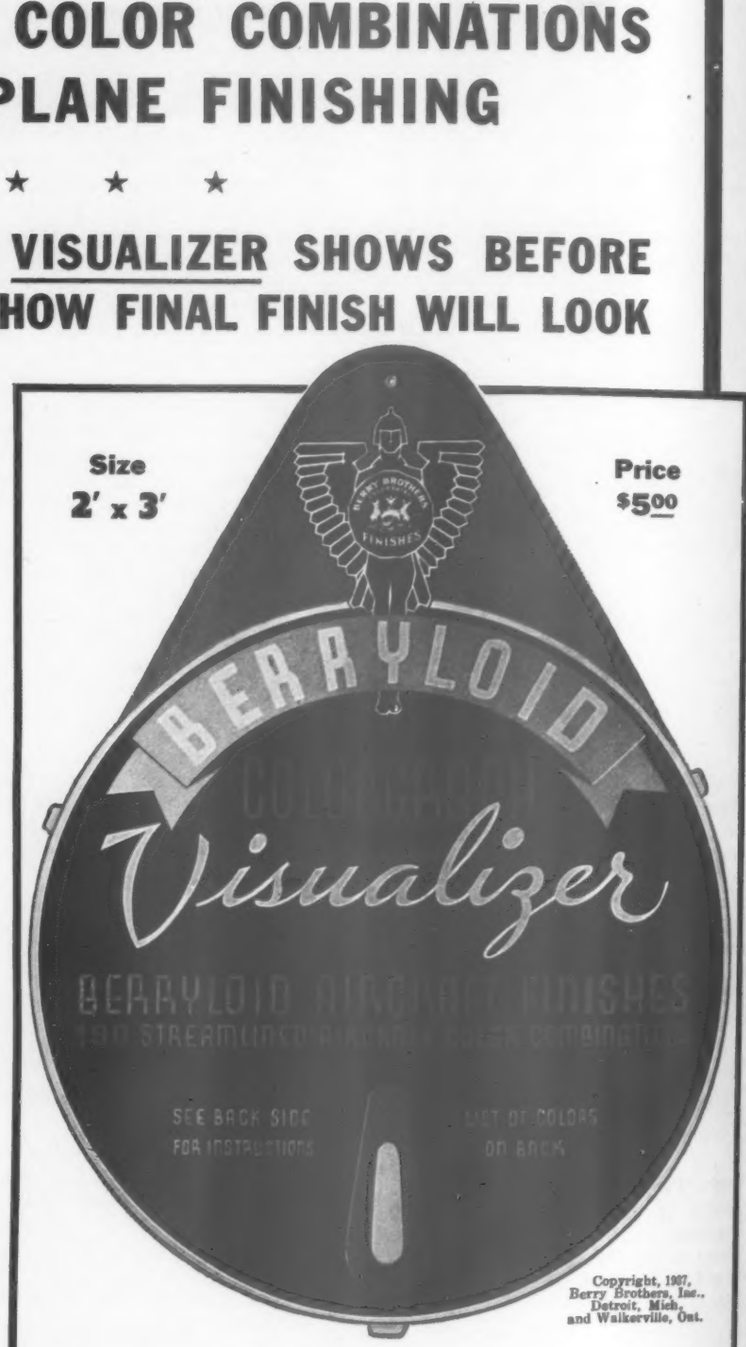


BERRY BROTHERS

PAINTS • VARNISHES • ENAMELS • LACQUERS

achievements in aeronautical engineering. Committee arranging the dinner is headed by HERBERT HOOVER. HARRY F. GUGGENHEIM, president of the Daniel Guggenheim Fund for Promotion of Aeronautics, will fly from New York to preside. Dr. Durand is holder of both the Guggenheim and John Fritz medal awards, was chairman of the Navy's Special Committee on Airship Design and Construction, a member of the Morrow Board appointed by President Coolidge in 1925, is a member of the N.A.C.A., and general editor of the 6-volume series on "Aerodynamic Theory."

» REAGAN C. STUNKEL has been appointed assistant to operations manager of Braniff Airways, in charge of maintenance. In addition to supervising the Braniff shops at Dallas, he will travel the line to supervise servicing operations at all stations on Braniff's routes.

» JOHN M. TYLER has joined the engineering staff of Hamilton Standard Propellers division of United Aircraft Corporation, and will devote his attention to stress measurement and vibration problems. During part of his eight years with General Motors Research Division, Mr. Tyler was in charge of vibration and balancing problems, taking a year's leave of absence to study vibration under Professor R. Grammel at Stuttgart. He then joined the Lycoming Division of Aviation Manufacturing Corporation, specializing in vibration problems, and also served as consultant to other aircraft manufacturers.

» At its annual meeting, Waco Aircraft Company reelected its officers and board of directors comprised of CLAYTON BRUKNER, president; LEE BRUTUS, vice-president and treasurer; L. E. ST. JOHN, secretary; J. M. HUTTON, JR. and R. G. CORWIN, directors.

» Two members of the industry, E. B. CHRISTOPHER and E. A. GRUMM, lost their lives in the crash of a Swallow plane 75 miles north of Los Angeles, on April 9th. Mr. Christopher, who was piloting the plane, was president of Swallow Airplane Company. He had recently developed a Menasco-powered Swallow coupe and financial arrangements for its production had been effected by Mr. Grumm, who was vice-president of Brashears & Company, investment brokers. Mr. Grumm had also been active in the financing of the Lockheed, Menasco and Ryan corporations.

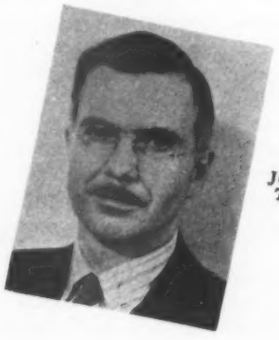
» Taylorcraft Aviation Company has added to its staff WILLIAM C. YOUNG, vice-president and general manager, and FRANK J. SULLIVAN, treasurer. Mr. Young was previously connected with the sales force of AVIATION, prior to that with Goodyear Zeppelin Corporation. Mr. Sullivan comes from Central Aircraft Manufacturing Co., a Curtiss-Wright Export Company subsidiary in China, of which he was vice-president and treasurer. At one time he was vice-president and treasurer of Curtiss-Wright Flying Service's 48 airports.

» EDWARD G. BERN, formerly West Coast publicity representative for American Airlines, has been made national publicity director with headquarters in Chicago. CARL ANDERSON, formerly Cincinnati sales manager for American, will take over Bern's duties in Los Angeles.

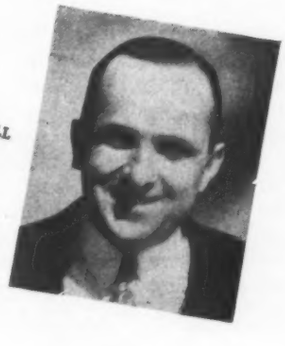
» JOE PLOSSER, president of Grand Central Flying School, Glendale, Cal., has been appointed superintendent of Ventura County Airport, Oxnard, Cal. Plosser will manage the port in addition to maintaining his present flying school.

» GEORGE E. BEVINS, instrument flying instructor for Aircraft Radio & Instrument Training Co., resigned to become Link Trainer instructor with Eastern Air Lines.

» ARTHUR C. CHESTER, well known racing pilot and engineer, has joined the Menasco Manufacturing Company as head of the service department. Chester will have charge of all experimental testing, installation, flight testing and field servicing of Menasco engines. He will be assisted by RUSSEL CHAMBERS and A. C. HEWITT.



JOHN M. TYLER



COL. J. CARROLL CONE

» MARSHALL HEADLE, long known as Lockheed's test pilot, left Burbank, Cal. Feb. 16th with the first of the new Lockheed Electra transports for British Airways, Ltd., England. After instructing British pilots in the operation of the Electra, Headle is scheduled to make a demonstration flight in a second Electra to Poland, Rumania, Jugoslavia, and other European countries.

» During the two years he has been engaged as engineering test pilot for Waco Aircraft Company, JOHN LIVINGSTON has retained his interest in Livingston Airways, Inc., operating the airport at Waterloo, Iowa. On May 1st he left Waco to join his brother, A. B. LIVINGSTON, in continuing and expanding the sales program of Livingston Airways, including the handling of Wacos and Taylor Cubs.

» Migrations: From the U. S.: COL. J. CARROLL CONE of the Bureau of Air Commerce, who before departing for Europe to study aviation abroad, was feted at dinner at Hempstead, L. I. . . . REX MARTIN, who is cruising about South America for the Bureau of Air Commerce. . . . LT. H. F. KLEIN and FRANK AMBROSE, who are making a tour of South American countries in the Grumman plane owned by Canadian Car & Foundry Co. . . . K. S. LINDSAY, representative of B. G. Corporation, who is on an extended business trip to the West Indies, Central and South America. Before returning he will visit nearly every country in Central and South America. To the U. S.: C. R. FAIREY of Fairey Aviation, Ltd. of England, honored on arrival with a luncheon sponsored by the Institute of the Aeronautical Sciences. . . . C. L. POWIS of Philips & Powis Aircraft Ltd., England, on a visit to Menasco and other aviation plants. . . . Famed Maurice Farman's son, MARCEL FARMAN, with his wife, honeymooning and peeping at America's private plane models. . . . AMY JOHNSON, just visiting. . . . . BISHOP PIERRE FALLAIZE, Catholic prelate of the Arctic, to buy a new airplane to facilitate coverage of his 600,000 square mile parish. . . . HANS STRANDRUD, connected with Widerøe's Flyveselskap A/S of Oslo, Norway, who recently got back from an Antarctic expedition. . . . PAUL HERMAN, who having completed three years' active service as captain in the Air Force of the Colombian government, is back at Roosevelt Field.

With the Great Silver Fleet

(*Continued from page 21*)

smallest detail of ships or of service is given a workout to the satisfaction of all. Requests are made. "Yes" or "No", says the Captain. Discussions arise, postponements are suggested. But "Let's get this thing settled *now*," says Eddie. That statement, often repeated is the keynote of the meeting.

And the results of such coordination of company problems are visible up and down the system, have been reflected in the record for safety and performance that led to the granting of the Safety Award by the National Safety Council on April 14. (See News section.)

And Eastern Air's operating problem is peculiarly its own. Flying along the Eastern seaboard, connecting the metropolitan centers of New York and Chicago with the nation's most popular winter playgrounds, Miami and the South of Florida, its traffic reaches a peak in the time of year when flying conditions all the way North of Jacksonville are far from ideal. The fact that, in spite of an unusually severe winter just passed, the line ran a high average of schedules completed with a perfect safety record speaks well for the skill of the pilot personnel and of the supporting ground services. Then too, the high passenger demand and high frequency of service necessary on the Washington-New York run has called for an intensive use of flying equipment never before attained in airline operation. Fifteen round trips a day had been flown between these two points, and plans calling for 20 or more trips ("Every Hour on the Hour") are projected for the near future. Small wonder that this section of operations is known as "The Merry-Go-Round" over the system.

EASTERN AIR LINES' operating history dates back to February 1927 when Harold Pitcairn through Pitcairn Aviation, Inc., was granted a contract to fly the mails between New York and Atlanta, Ga. Shortly afterwards, this route was extended through to Miami. By May 1, 1928, operations over the route were in full swing with 41 employees in the company. On July 10, 1929, operations of Pitcairn interests were taken over by North American Aviation, Inc., but the name Pitcairn Aviation was retained until Jan. 17, 1930, when Eastern Air Transport, Inc., came into existence. On August 18, 1930, with over 3,000,000 miles of flying experience behind it, Eastern Air Transport inaugurated passenger services over its system. Fords and Fokkers were used at first, but were shortly thereafter replaced by a fleet of Curtiss-Wright Kingbirds and Condors. By early 1931 the line was flying 10,200 scheduled miles per day, had a personnel of 280 employees. New schedules were added rapidly until E.A.T. was serving the whole area between New York, Atlanta, and Miami. In April, 1933, as a result of a merger between North American Aviation, Inc. and General Aviation Corporation, control of the company passed to General Motors. It was at this time that Captain Rickenbacker first became associated with the management. On February 16, 1933 E.A.T. purchased the entire assets of Ludington Lines, the "Every Hour on the Hour" service between New York and Washington. In Oct., 1933, experiments were conducted with the installation of sleeping berths in the Curtiss-Condors, thus making Eastern Air Transport the first in the country to offer sleeper accommodations.

On February 9, 1934 the blow fell when all U. S. mail contracts were cancelled. Just prior to cancellation, the line numbered 534 persons among its employees. In April, 1934, a new company, Eastern Air Lines Division of North American Aviation, Inc., was formed to bid on the new mail contracts, and it is this company that is in existence today operating the territory pioneered by E.A.T. In the years that have followed progress has been rapid. All the old Kingbird and Condor equipment has been replaced by the more modern Douglas DC-2s and lately the Douglas DC-3s. Lockheed Electras are used on certain local schedules.

When AVIATION first became interested in the problem of airline maintenance, (1931), we turned naturally to Eastern Air because its head office was at that time just across the river in Brooklyn. Harold Elliott, then in charge, lent a sympathetic ear to the idea of cooperating on maintenance problems, made it possible for us to use the system, to visit his own shops, then in Atlanta, and the Pan American Base at Miami. But what a contrast was the trip to Miami then and now! We made the first trip before the Richmond-Charleston-Jacksonville cut-off was in use. Best time was a day and a half, via Atlanta, with an overnight stop at that point. And all the way from Washington to Miami in a Kingbird! — with eleven stops! We couldn't help but think of that when we made the New York-Miami trip the other day in seven hours 35 minutes with one stop at Charleston in a DC-3. Verily, times have changed!

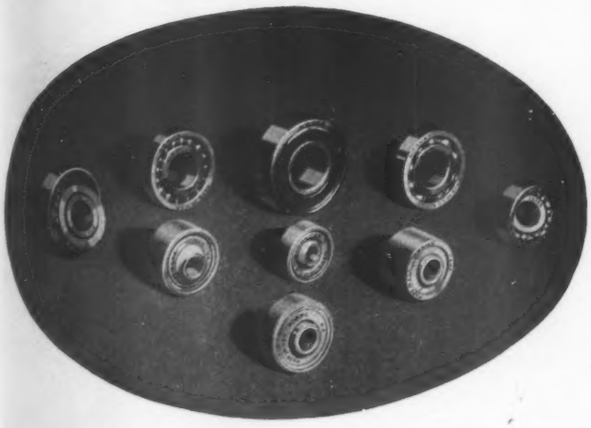
BACK IN 1931, Eastern Air Transport started something, put a good-looking gal on board each plane as hostess. Chief idea in those days was to lend a little atmosphere and thus, perhaps, distract the attention of the customers from the fact that they were flying through the air. When Contract Cancellation Day came in 1934, the hostesses disappeared from E.A.T., the first of many moves to tighten the belt to survive the lean years. Although practically every other major line in the country continued, or has since inaugurated, a hostess system, the newborn EAL then persistently refused to reconsider, made the co-pilots responsible for looking after the needs of passengers aboard ship. But with the coming of the new equipment and the trend toward blind flying, the job in the cockpit became complicated enough to require the services of both pilots most of the time. Besides, with increasing passenger volume, and the need for keeping a sheaf of records on the ship at all times, it became increasingly obvious that a third member of the crew was desirable. Again EAL produced an innovation, is the only domestic airline so far to hire and to train a group of young men as cabin attendants. Not entirely new, the idea, for Imperial Airways and Pan American have operated steward systems for years, but new enough to cause more than a ripple in U. S. air transport circles. And the results seem to be definitely on the positive side, so far. Pilots like the Flight-Steward idea because they say (1) they can turn over all the paper work on the ship and expect consistent results, (2) the Flight-Stewards can shoulder a great deal more of the responsibilities in handling passengers in minor emergencies, weather cancellations, etc., (3) they can handle baggage and the heavier jobs about the ship without calling on the pilots for help, and (4) the sex problem is eliminated. Passengers have been uniformly enthusiastic in their comments. They appar-

(*Turn to page 73*)

The STEARMAN "PT-13" ARMY TRAINER

Is Equipped With

"NORMA-HOFFMANN" PRECISION BEARINGS



The NORMA-HOFFMANN PRECISION line of ball, roller and thrust bearings comprises 108 distinct series embracing over 3,000 catalogued sizes (including the aircraft control bearings pictured above)—a PRECISION BEARING for every load, speed and duty in aviation service. Write for the Catalog and special Aircraft Control Bulletin. Let our engineers work with you.

The "primary training airplane" here shown is one of a fleet of 98 being built for the U. S. Army Air Corps by the Stearman Aircraft Company of Wichita, Kansas. NORMA-HOFFMANN PRECISION BEARINGS are employed in numerous places throughout the controls. The Pioneer turn-and-bank indicator and Sperry instruments employed, are also NORMA-HOFFMANN equipped.

"Where the bearings must not fail"—on land, at sea, and in the air—NORMA-HOFFMANN Precision Bearings are the choice of engineers and designers of planes, engines (including superchargers), engine accessories, control apparatus, instruments, radio equipment, cameras and landing field equipment.

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

PRECISION BALL, ROLLER, AND THRUST BEARINGS

MIXTURE TEMPERATURE *Okay...*

THE WESTON
MODEL 606
CARBURETOR MIXTURE TEMPERATURE INDICATOR

Model 606 serves a dual purpose. Furnishing a dependable indication of the temperature in the carburetor mixture chamber, it informs the pilot whether efficient, prescribed temperatures are being maintained . . . and warns against the possibility of ice formation. Here, again, transport companies choose WESTON . . . because of the proved dependability behind this name . . . Weston Electrical Instrument Corp., 616 Frelinghuysen Avenue, Newark, N. J.

WESTON *Aircraft Instruments*

AIR TEMPERATURE INDICATORS • OIL TEMPERATURE INDICATORS • CARBURETOR TEMPERATURE INDICATORS • BLIND LANDING INDICATORS • RADIO COMPASS INDICATORS • CABIN TEMPERATURE INDICATORS • CYLINDER TEMPERATURE INDICATORS • ELECTRICAL TACHOMETERS • AMMETERS • VOLTMETERS • VOLT-AMMETERS

With the Great Silver Fleet

(*Continued from page 70*)

ently like the unobtrusiveness of the service and the fact that they feel freer to make demands upon men than on the girls.

Another novelty that is presently to appear on all Eastern Air ships is a small folder to be placed in the hands of each passenger, giving a photograph and a brief biography of the captain and pilot on each run. (Note here, parenthically, that Eastern Air, looking toward the day when ships are going to be very large and will carry half a dozen members of the crew, has adopted the title of Captain and Pilot in place of the older Pilot and Co-pilot designation.) It is to be regretted that space makes it impossible to reproduce here the complete biographies of all the men who fly Eastern Air. There are many old-timers among them, most of them naturally occupying left-hand cockpit seats as Captains. For example, there is Johnny Armstrong (EAL since 1928) with 6,200 hours in commercial aviation and a penchant for alligator and snake-hunting; George W. (Pete) Bransom who flew out to Newfoundland to assist the Merrill-Richman expedition, — with his 11,000 hours; Everett Chandler (1931), ex-army pilot with 7,000 hours; Bob Chew, one of Eastern Air's oldest, with 8,500 hours; Archie Comer, champion hunter and trap-shooter, 8,000 hours; Fred Davis, an ardent gardner with 9,000 hours; W. F. Dawson who deserted the study of law for aviation, 9,000 hours; L. A. Dice, in aviation since 1924, with 5,000 hours; Joe Duckworth, tennis champion and student of law, with 7,000 hours; Paul Foster, radio researcher with 5,500 hours; John Gill, army pilot, barnstormer and instructor, 5,000 hours; Bob Hewitt, who started in aviation with a glider in 1912, rescuer of the German airplane Bremen's crew in 1928; J. D. Hissong, ardent photographer, pilot since 1926; Harold Hough, in aviation since 1918, 4,500 hours; Leland Jamieson, short story-writer of note, with 4,000 hours; Donald Johnston, one of the oldest commercial pilots in the country, with Eastern Air since 1928; Frank Kern, former navy pilot, 7,000 hours; J. Olen King, in aviation since 1917 with 9,000 hours; Joseph Kuhn, who first soloed in 1918, 7,100 hours; Frank Little, formerly of the R.F.C., 8,500 hours; Neil McMillan, nineteen years of flying with 8,000 hours; Glenn McDonald, another camera enthusiast, with 6,500 hours; Leo McGehee, real old-timer and unofficial Eastern Air Lines golf champion, 6,500 hours; L. E. McLaughlin, seventeen years in aviation with 9,000 hours; Dick Merrill, one of the oldest EAL pilots, known also for his Transatlantic adventure in 1936, 12,000 hours; Charles Meyers, a million-miler, flying since 1915; Robert Minick, ex of the U. S. Army, former barnstormer, 6,500 hours; Larry Pabst, gentleman-farmer, with EAL since 1929, another million-miler; E. H. (Pete) Parker, EAL's only pilot-grandfather, flying since 1917; W. F. Phillippi, another camera crank, 7,000 hours; Earl Potts, a million-mile pilot formerly with the Air Corps; Walter J. Shaffer, military medal winner during the war, one of EAL's ranking veterans with close to 12,000 hours; Ralph Smith, ex-army pilot and barnstormer, another million-miler; Ferman Stone, an original Pitcairn pilot and a confirmed sportsman; Glenn Thomas, expert rifleman, close to 9,000 hours; Foster W. Tompkins, pilot since 1923, 11,000 hours; Champe Taliaferro III, private plane owner as well as veteran transport pilot; Gilbert Waller, air corps trained, a veteran with 8,000 hours; Lee Willey, photography his chief interest apart from flying, 9,000 hours; W. Wipprecht, Jr., mighty hunter and motor-boating enthusiast, 8,000 hours; Bob Young, ex-navy pilot, with Eastern Air since 1930, 6,000 hours.

Therein lies one of the reasons for Eastern Air Lines' outstanding operating record. The rest of the story is told in the records of the nearly a thousand other employees, the maintenance men, the radio men, the weather forecasters, and the traffic personnel that man this great system from the Great Lakes to the Gulf. In all their daily tasks on which depend the safety of the ships and their cargoes in the air, they work with a singleness of purpose that in itself is a tribute to the quality of the leadership under which they operate.

Curtiss Controllable

(*Continued from page 39*)

Provision is made on the hub for mounting the conventional type deicing spinner and slinger ring equipment.

The constant speed control consists of a conventional flyweight type governor driven at approximately engine speed. The flyweight force is balanced against a spring, the initial compression of which may be adjusted by the pilot in selecting the desired engine speed. While the speed is balanced, the pitch changing circuits are open and no change takes place. When the speed is above or below that desired, the flyweights through a plunger, actuate a switch to close the increase or decrease pitch circuit and effect the necessary correction. The governor is adaptable to either mechanical or remote electrical control from the cockpit.

PROPELLERS FOR DURAL BLADES

Model	Normal Rating HP	Normal Rating RPM	Take-off Rating HP	Take-off Rating RPM	Hub No. Blade	Hub ATC	Blade Design	Blade Max. Diam.	Blade Width	Blade ATC	Prop. Wt.
C-4315-D.....	800	1720	900	1790	3	568	89302	10 ft.	9.13	569	296
C-532-D.....	850	1445	1000	1515	3	570	89300 89301	12 ft. 11 ft.	10.74 9.96	572 571	375 342
C-535-D.....	900	1633	1000	1700	3	Pending	55914	11-6	10.74	Pending	442

PROPELLERS FOR STEEL BLADES

C-4315-S.....	700	1750	700	1750	3	Pending.	PS&B 551	9 ft. 9	9.00	Pending.	281
C-5315-S.....	850	1633	950	1700	3	Pending.	PS&B 650	11 ft.6	9.88	Pending.	367

UNITED'S *Mainliners*

shorten coast-to-coast schedules four hours and forty minutes.

Four years ago United Air Lines' announcement of twenty-hour flight between New York and San Francisco made headlines. Now their Douglas DC-3 Skylounges and DST's (Sleepers) will make this run in fifteen hours, twenty minutes.

Sperry Gyropilots are installed on all of United's Mainliners.

SPERRY GYROSCOPE CO., Inc.
BROOKLYN — NEW YORK

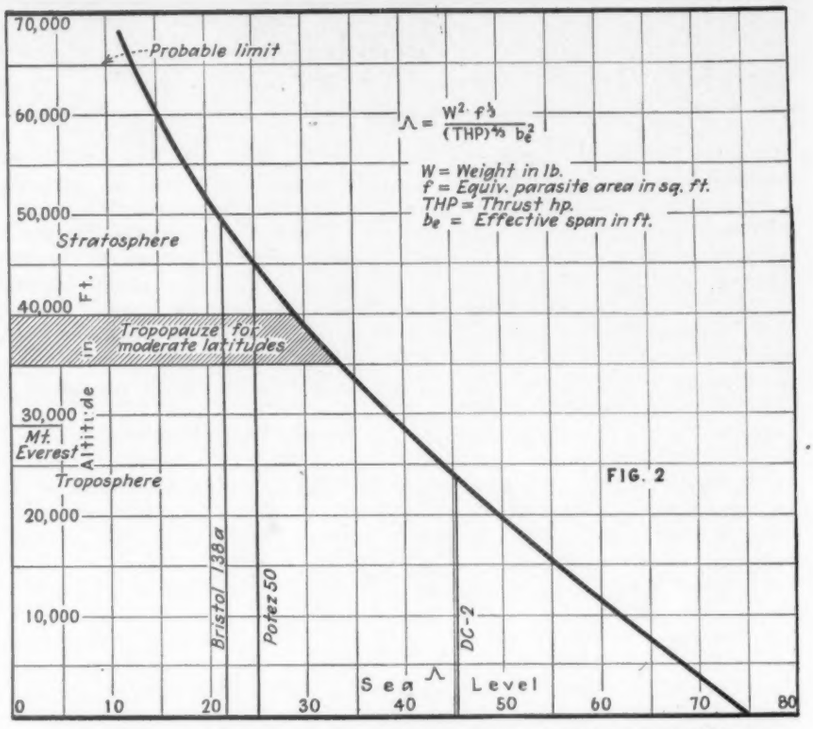
How High?

(Continued from page 29)

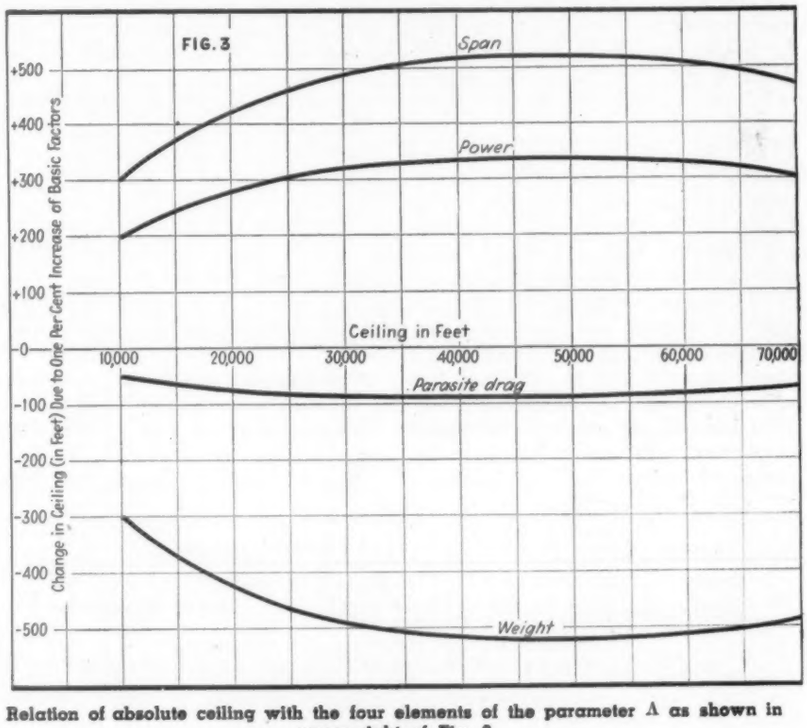
Potez 50, illustrations of which are included in this article. In addition, one of the modern American passenger transports, the Douglas DC-2, is shown on the figure for comparison. Each of the two record holding ships was equipped with the normal type of gear-driven supercharger, although the supercharging was carried to a much higher altitude than usual. In the United States there are many planes in operation which are equipped with exhaust driven turbo-superchargers. It is characteristic of these units that they are capable of carrying their supercharging up to much higher altitudes than is possible with the gear-driven types because they recover energy which is normally lost through the exhaust of the engine. As a matter of fact, there is so much energy available in the exhaust gases that by selecting the proper design for the turbo-supercharger for any given altitude it is possible to carry the supercharging beyond any altitude to which the conventional airplane of today will fly. Such a unit should certainly be incorporated in the airplane which would establish the ultimate aircraft altitude record.

ASSUMING that a turbo-supercharger is used, estimates of the factors governing the maximum altitude have been made and these estimates indicate that 65,000 ft. is the probable limit to which airplanes of the type considered conventional today would ascend. Such airplanes would probably be designed with higher aspect ratios and wing loadings than those previously used in such attempts and would be somewhat cleaner. Of these improvements it is felt that the most important by far is the turbo-supercharger and second the increased aspect ratio.

It is interesting also to estimate what might be done in this country to advance the record at the present time. In this regard it must be stated that the United States has a decided advantage over the European nations in the matter of the turbo-supercharger. There are in this country a large number of service airplanes using these units in regular operations while in Europe the turbo-supercharger is apparently still in the experimental stages. For this reason alone it is felt that an airplane could be designed and built in this country at the present time which would be capable of breaking the latest British record by at least a mile in altitude. Such an advance of the altitude record would effect a considerable change in the trend of the altitude versus time curve represented in Fig. 1 and bring it more in line with the trend of the other major records.



Variation of altitude with the parameter A (see formula upper right)



Relation of absolute ceiling with the four elements of the parameter A as shown in upper right of Fig. 2

Q. B. I.

(*Continued from page 23*)

Magnetic Reciprocal bearing of the airplane from the Station.

From two or more D.F. (Direction Finding) stations working together, the pilot can be given his bearing and distance from the station.

The three radio stations which give D.F. service in the London-Continental Airway Area (Croydon Control) shown in table below.

Bearings are accurate to within 2 degrees. The Croydon long range station on 333 Kcs works with about 1KW anode power, the short range transmitter on 322 Kcs with about 70 watts anode power. The *effective* range of either transmitter however is completely limited, not by distance, but by the number of airplanes that can successfully be worked at any given time.

When QBI is in force, all airplanes approaching Croydon are given their turn for landing and must obey instructions from the Control. It will be seen therefore that in addition to giving positions, Croydon has to exercise a definite control over the positions — height and speed — of all planes in the Croydon controlled area and is responsible for the avoidance of collisions.

It does seem that the *principle* of divorcing direction-giving from Area and Airport control as is practiced in the U.S., is fundamentally correct, and some arrangement will have to be made here for additional frequencies to be available so that the same *principle* can be followed, though it is not thought likely that directional radio range courses will be adopted, but rather a number of omni-directional radio beacons on which the airplanes themselves will take bearings by means of proper D.F. equipment—rotating loops etc. The actual control of position will thus be independent and on a different frequency.

Whether it is advisable for the Airline Companies to control the movements of their own planes with their own radio stations, subject of course to the authority of the Area and Airport Control, is again dependent largely on available frequencies.

Weather Report Service. Weather reports, weather forecasts and air navigational warnings are broadcast from the Air Ministry meteorological Radio Station at Borough Hill, Northamptonshire, on a frequency of 254 Kcs (1181 meters) daily. The report stations from which weather information is received are graded as KEY stations, MAIN Stations and AUXILIARY Stations and are located all over the country. Broadcasts, which are arranged as far as possible for the stations along the internal air routes, are at certain stated times during the day, and reports from KEY stations are announced 15 minutes after each hour, from 7 a.m. to 6 p.m., from Main Stations at 30 minutes after the principle hours of observation 7, 10 a.m.; 1, 4, and 6 p.m. and from auxiliary stations two or three times a day.

The current report for Croydon Airport is broadcast every quarter-hour from Croydon Airport Radio Station at 5, 20, 35, and 50 minutes after each hour from 7 a.m. to 10 p.m. by C.W. telegraphy on 336 Kcs (893 meters).

Blind Approach and Landing Installations. A short wave landing approach system known as the V.H.F. (Very High Frequency) is available at Heston Airport, and a Lorenz installation which conforms to the same general principles is now available at Gatwick. For the main beacon a frequency of 35.83 megacycles (8.37 meters) and for the inner and outer marker beacons 38.00 megacycles (7.89 meters). The outer and inner marker beacons are two miles apart, must be crossed at not less than 650 feet and 100 feet respectively, the inner marker beacon being just outside the airport boundary.

Radiation from the main beacon is into two sectors — North and South — dashes go into the Northern sector, dots the South, the equi-signal beam being 4° wide towards the East. The Outer Marker Beacon radiates twice per second a signal modulated at a frequency of 700 cycles a second. The Inner Marker Beacon radiates six times a second a signal modulated at a frequency of 1,700 cycles a second.

It is emphasized in the Air Ministry Notice to Airmen in which a description of the Beacon is given, that the installation is to assist landing approaches when the vertical visibility is not less than 40 meters — 120 feet — and that permission to enter the controlled Zone must first be obtained from the Airport Control, with whom 2-way communication must be maintained while landing.

Few airplanes have the equipment for making a blind approach, and the opinion has been expressed that as the blind approach path to Gatwick lies over the railway which is carried on the top of an embankment forming the eastern boundary of the airport, it is quite possible for an airplane making a too low blind approach to write off one or more railway trains on the way in. But all new schemes merit criticism and time alone will tell.

		Air — Ground	Ground Air	Service.
Croydon (GED)	Telegraphy on C.W. (Continuous waves)	333 KCS (900 metres)	336 KCS (893 metres)	Continuous
	C.W. Telephony and W/T	363 KCS (825 m)	363 KCS (825 m)	8 a.m. — 9.30 p.m.
	QBI conditions W/T D.F. (short range)	322 KCS (932 m)	322 KCS (932 m)	QBI
	(To be changed shortly to 327 KCS. 917 metres)			
Lympne (GEG.)	C.W. W/T	333 KCS (900 m)	336 KCS (893 m)	(Continuous)
	C.W. R/T	363 KCS (825 m)	363 KCS (825 m)	8 a.m.— 9.30 p.m.
Pulham (GEP)	C.W. W/T	333 KCS (900 m)	336 KCS (893 m)	Continuous
	C.W. R/T	363 KCS (825 m)	363 KCS (825 m)	8 a.m.— 9.30 p.m.

L. A. Show

(*Continued from page 25*)

with a recorded story of modern air transport operation, further enhanced public interest in the Douglas display. Beautifully exhibited, the Lockheed Model 12 drew equal attention, and the crowds were entertained with a continuous motion picture presentation of Lockheed production methods. Nearby was the new Waterman Arrowbile (see page 32) which never failed for an audience. Waterman enhanced this display with an excellent moving picture, a periodic lecture over a public address system, and a twice daily demonstration of

(*Turn to page 78*)

AIRLINE MILLIONTH PASSENGER
From American Airlines, Inc., officials went congratulations yesterday to Theodore C. Baker, Brookline, Mass., business man. He was the millionth passenger carried by the company. Baker boarded a Douglas plane in Boston bound for New York on the first leg of a vacation trip which made him the world's first 1,000,000th airline passenger.

THE achievement of American Airlines in being the world's first airline to carry 1,000,000 passengers is a record in which the entire United States may well be proud.

It is *your* record, after all.

Men, motors and machines, have striven unceasingly to make this record possible and to see to it that American aviation tops the world. But only because of the confidence which 1,000,000 of you have placed in commercial aviation and in the outstanding service which American Airlines offers has this signal record been achieved.

To you, and to American Airlines, Douglas expresses its sincere congratulations. Douglas Aircraft Company, Inc., Santa Monica, California.

WHEREVER YOU GO, TRAVEL VIA LUXURIOUS DOUGLAS EQUIPMENT

In AMERICA . . . on American Airlines, Inc. . . . Braniff Airways, Inc. . . . Eastern Air Lines . . . Pan American Airways . . . T.W.A., Inc. . . . United Air Lines . . . and Wilmington-Catalina Airline, Ltd.

In SOUTH AMERICA . . . on Pan American Grace Airways.

In AUSTRALIA . . . Australian National Airways Pty. Ltd.

In EUROPE . . . OELAG in Austria; Deutsche Lufthansa in Germany; K. L. M. in the Netherlands; L. A. P. E. in Spain; L O T in Poland; C. L. S. in Czechoslovakia; Avio Linee Italiane in Italy; Swissair in Switzerland; and A. B. Aero Transport, Sweden.

In THE ORIENT . . . on Japan Air Transport, China Nat'l Aviation Corporation, and K.N.I.L.M. in the Netherlands Indies.

L. A. Show

(*Continued from page 76*)

attaching and detaching the wings.

Other striking features included the spendid demonstration of blind flying and blind approach to an airport along a radio beam by Paul Mantz' Link trainer in the Standard Oil Company display. Texaco sponsored regular demonstrations of the TWA homing radio. Sperry mounted a gyropilot in such a manner as to show it in actual operation on a rotating and tilting table. Curtiss-Wright and United showed engine cut-aways, and in the Curtiss-Wright display a controllable propeller was continually feathered for a practical demonstration of this feature (See page 38). Bendix demonstrated Scintilla SC and Vertex ignition units, and also showed various other operating instruments or accessories such as an outboard engine churning away in a tank of water, an oscillograph, making speech waves visible. The Goodrich wing de-icer was shown in operation by Bendix, and Lockheed showed their new propeller de-icing device which feeds engine oil over the blades in metered quantities. Beech called attention to his newest 250 m. p. h. D-17-W Beechcraft by using a professional actor who staged regular performances as a "mechanical man". Major Moseley had his Aircraft Industries display featured by a noisy demonstration of his Baby Cyclone modelplane engine. Kollsman showed a giant reproduction of a sensitive altimeter with the hand continually climbing. Menasco had five pedestal mounted standard in-line engines rotating in unison.

PRECISION BEARINGS built a revolving cyclorama to display Norma-Hoffmann bearings. Thompson showed an elaborate series of scale models of all Thompson Trophy winners. Fred Novinger and Slim Freitag took turns swinging from the wing tip of the Howard DGA-9, thereby illustrating at one and the same time the ruggedness of the plane and the fact that Johnny Weismuller has no monopoly on the role of Tarzan. Other interesting and fascinating exhibits were staged by Northill Anchor, with a continuous moving picture laying bare the private life of an anchor; Elvy Kalep, who carried aero education into the cradle with her Air Babies books and dolls and who dispensed Air Baby refueling food to sundry weary wayfarers; Baker Steel & Tube Co., with a miniature Summerill tubing drawbench; Aluminum Company of America, with an elaborate array of aluminium shapes and structures; California Flyers with an aerial beacon which proclaimed the flying schools advertising message; and many others. There were planes on the floor which had never before been publicly exhibited: Aeroneer, Stearman-Hammond, Swallow, Waterman and Rose Parrakeet. There was the folding wing Security Airster, the tailless Arrowbile, the Continental W-670 injection engine, the Stearman-Hammond and Waterman tricycle landing gears and the Stearman-Hammond rudderless control; the use of automobile engines by Arrow and Waterman, the belt driven propeller and detachable wings by Waterman, the one bladed Everts propeller; the new hydraulic Goodrich-Palmer-Hayes brake system, the Pesco accessory drive gearbox, the Jaeger electric tachometer, the Switlick miniature parachute seat pack built for the Taylor Cub, and many other novel displays. Cessna showed the new C-37 with electrically operated wing flaps. Howard Batt displayed the new STA Ryan. Norman Larson exhibited a Ranger powered Fairchild and two models of Ranger engines. The newest Wacos, Taylor Cubs, Porterfields, Rearwin, Monocoupe and Stinson were all very much admired Engine builders were all there from A to Z. Elaborate displays were featured by American-La France fire extinguishers, Walter Kidde Lux system, Collins-Powell with Elastic Stop Nuts, Garrett Supply Company with Fafnir, Aero Supply, Cleveland Pneumatic, Hays Industries, Pesco, and Westinghouse all under its wing. Radio equipment was shown by Western Electric Company.

And sales were made, real sales right off the show floor, and more after the show closed and prospects had a chance to get demonstrations. Arrow closed the first sale, the day the Show opened. Waterman reported five Show sales, Waco three bona fide sales immediately after the Show, Taylorcraft twelve sales, Pacific Aircraft Sales (Fairchild) two sales, Beech closed three or four sales after the Show was over, Stinsons were being sold on sight and later on demonstration. Prospects were being lined up at an astonishing rate, and actual sales were made also by Aircraft Associates (Taylor Cub), Batt (Ryan), Carberry (Cessna), Huchendorf (Rearwin), Howard, Monocoupe, Petersen (Rose Parrakeet), Porterfield, Security, and Swallow.

As the Show closed, with the usual confusion of shattered wallboard backdrops and colored cardboard alphabets underfoot, the determination to do better in '38 was voiced on every hand. Some of the suggestions for next year include cooperation of industry groups to stage more elaborate educational exhibits. There is talk of planes bobbing up and down against a moving backdrop to show rate of climb instruments in action, circling models over model ports to illustrate radio approach, better display of de-icers, of radio, of the automatic pilot (possibly through some sort of modelplane hook-up); of a large cooperative airline rotunda with demonstrations of dispatching, etc., and many other features to crystallize the educational side of the show that was so evident this year. There is also the suggestion that some cooperative effort be made to get prospects back and forth between the show building and a demonstration airport.

D C 4 Details

(*Continued from page 37*)

up with double lower berths on each side of the aisle and upper singles. Due to the relatively high position of the passenger cabin vision will be unusually good from all seats. General dimensions of the plane are such as to remove power plants farther from the cabin than in any previous model, which will aid in further reducing the noise level inside.

An idea of the DC-4's relative size and performance may best be gained by comparison with the present DC-3:

	DC-4	*DC-3*
No. of passengers.	40	21
Crew	5	3
Span	138 ft. 3 in.	95 ft.
Length	97 ft.	64 ft. 5 in.
Height	24 ft. 4 in.	17 ft. 6 in.
Engines	Four of 1250 hp.	Two of 1100 hp.
Cruising range	2200 mi.	1800 mi.
High Speed	237 m.p.h.	216 m.p.h.
Gross weight	60,000 lb.	24,000 lb.
Absolute ceiling	24,000 ft.	24,000 ft.
Service ceiling	22,900 ft.	21,800 ft.
Flight on 2 engines at	7,700 ft.	On one at 8,200 ft.
Useful load	20,000 lb.	8,294 lb.
Mail, express, baggage	6,500 lb.	3,450 lb.
Landing speed	68½ m.p.h.	64 m.p.h.

*Corona** IMPAIRS SPARK PLUG PERFORMANCE

Every good pilot inspects the vital parts of his ship before each flight. Every strut and stay, every instrument, every part of the engine is subjected to the closest scrutiny at regular intervals. Yet 9 out of 10 pilots fail to catch that ever-growing menace —corona in spark plugs. . . Corona has been an ever-present danger in all mica aircraft spark plugs for a good many years and very often appears even in brand new ones. Champion Nocorona Mica Aircraft Spark Plugs, positively eliminate corona. Hard starting and missing, fouling and rough idling caused by corona, become things of the past and engine performance improves tremendously. . . Install a set of Champion Nocorona Spark Plugs in your engine. You can always depend on Champions.

Contractors to U. S. Army Air Corps.

CHAMPION NOCORONA MICA AIRCRAFT SPARK PLUGS

*Corona is electrical current leakage within the mica insulation and paralleling the center electrode of the spark plug. It is visible through the translucent mica core and obviously impairs the spark at the gap.

American Airlines, Carrying 1,000,000 Passengers

Has Flown Over 75 Million Miles in Feeder Line Service With

LYCOMING ENGINES

THE R-680-D SERIES

260 Horse Power Lycoming Engine

★ Cooling Fin Area — 20 sq. in. per cu. in. Displacement
★ Automatic Valve Gear Lubrication
★ Many Other New Features and Design Refinements

Write for Descriptive Booklet

AVIATION MANUFACTURING CORPORATION
Lycoming Division
WILLIAMSPORT, PENNSYLVANIA

Yes, boys, it's one smooth plane . . . a job to catch the eye of any pilot! Look at those lines! Neat . . . slick. And look at that finish! Colorful . . . beautiful . . . thanks to Sherwin-Williams! ▸ There's more than meets the eye in the Sherwin-Williams Airplane Finishes that give snappy beauty to Arrow Aircraft's "V 8" ships. They keep fabrics taut and smooth . . . add safety, speed. They protect against heat and cold, rain and sleet. ▸ Sherwin-Williams Airplane Finishes do all these things and more and do them economically . . . strictly in keeping with Arrow's low cost requirements. Arrow knows the best costs the least in the long run! ▸ You'll want all the facts about S-W Airplane Finishes. Write for them to The Aeronautical Division, The Sherwin-Williams Co., Cleveland, Ohio.

Opex Q-B Clear Nitrate Dope
Opex Q-B Pigmented Dope
Opex Dope Thinner
Red Oxide Metal Primer
Opex Aero Enamels
Gas Engine Enamels
Airplane Spar Varnishes
Opex Polishing Compound

SHERWIN-WILLIAMS PAINTS

AIRPLANE FINISHES

SEE THE SHERWIN-WILLIAMS FINISHING ENGINEER

Do you know that . . .

each month our subscription department receives more than 150 requests for "back" issues of AVIATION?

•

If we printed extra copies of our monthly issues, we would be glad to comply with these requests, but unfortunately we have no way of knowing in advance just how many of our newsstand readers will "miss" an issue.

•

But We Do Know — that each of these requests indicates a reader has "missed" just the issue he could make valued use of.

Insure your receiving AVIATION *regularly by filling in the coupon below, today . . .*

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Here is my check for $5.00. Send me Aviation for one full year.

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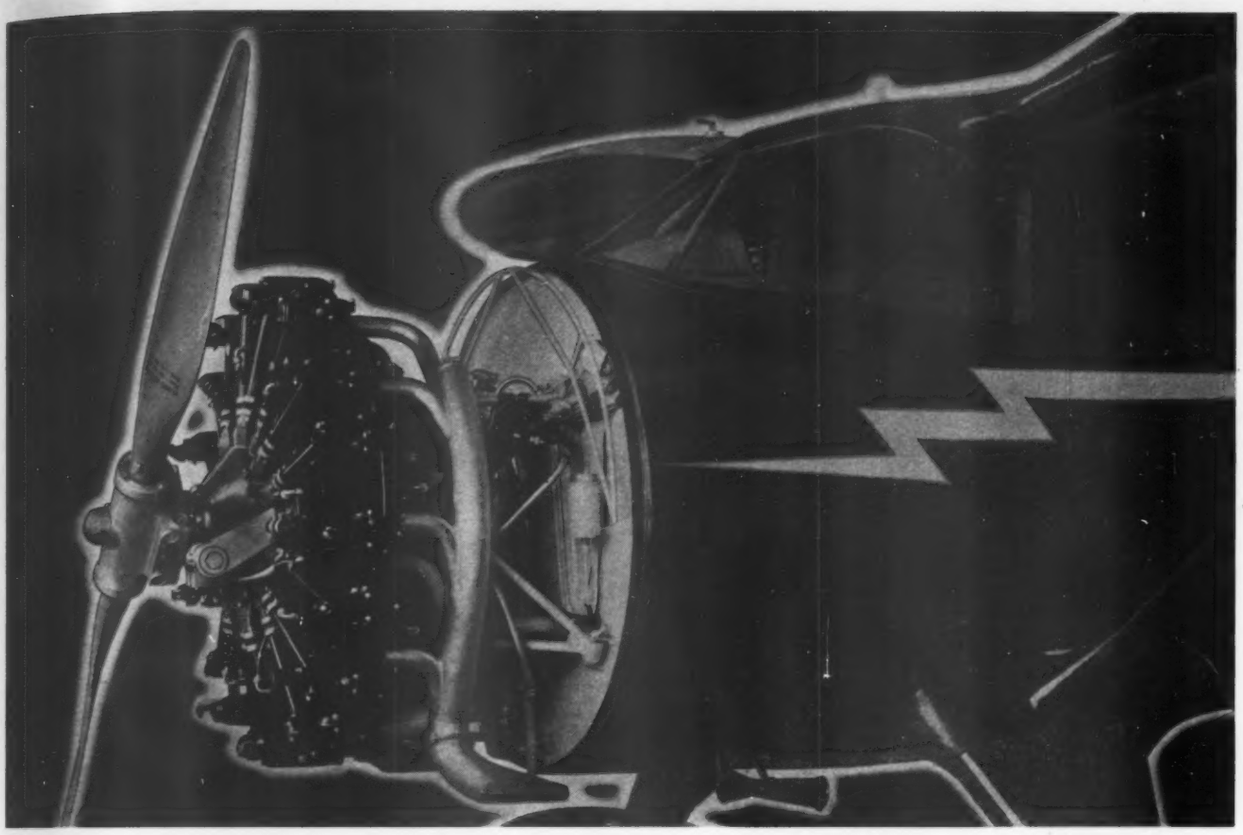
SUBSCRIPTION RATES:
United States, Mexico and Central and South American countries, $3 a year; Canada (including duty), $3.50 a year; All other countries, $6 a year or 30 shillings. Member of A.B.C.



NOW—100 Hours Between Engine Checks

Save $75.00 Every 100 Flying Hours

The R-680 Lycoming Engine became famed in the early '30's for reliability and low maintenance costs. Continued improvements through use by Airlines, the U. S. Government, Operators, and Private Flyers has kept this product ahead of its field, outselling all other makes in this power class.

The new R-680-D Lycoming Engine is destined to create another HIGH in dependable performance and low operating cost because its design embodies enclosed rocker-arm boxes with pressure lubrication through cam followers and push rods to rocker arm bearings, super-finned cylinder heads cooling BOTH intake and exhaust sides, Nitralloy accessory drive shaft, deep bossed aluminum crank case and other notable improvements found only in the latest pursuit and airline engines.

Stinson has followed the same consistent program of constant improvement without basic, obsoleting changes and now produces, through refinements in design and manufacturing technique, an airplane which is acknowledged to be the most advanced, as regards safe, trouble-free operation, of any airplane in the entire cabin category.

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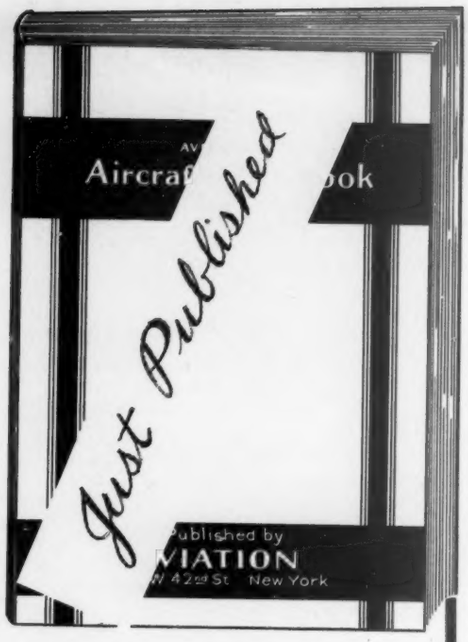

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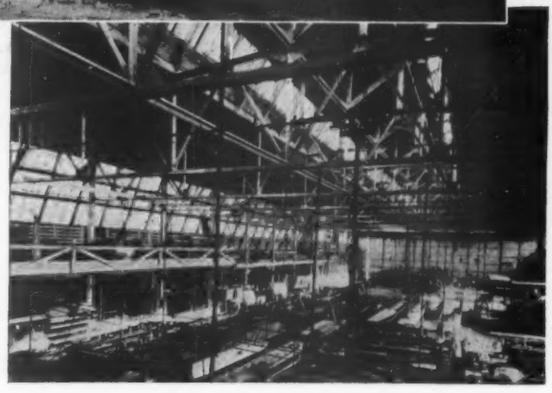

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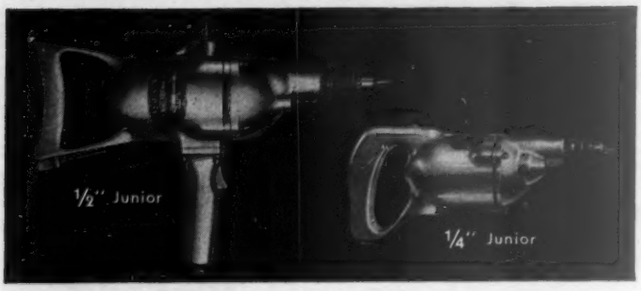

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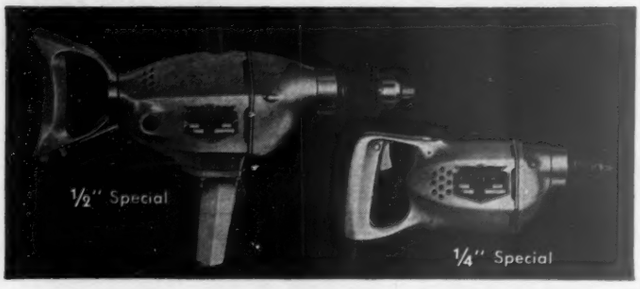

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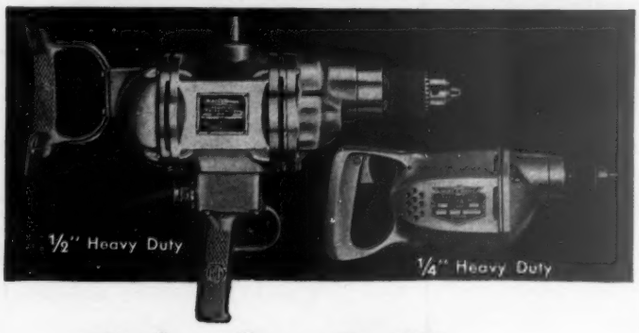

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